JULY 11, 1931

Railway Age

FOUNDED IN 1856

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"The Way to Operating Economies"

appears on page 43 in this issue as the opening article of a series which will continue weekly throughout the remainder of the year. These articles will show what is being done and can be done to secure still further railway operating economies. They will express in dollars and cents, wherever practicable, the operating economies to be effected through the extensive application of modern appliances, materials and equipment. They will report the findings of the survey which the *Railway Age* is conducting into the field of possible railway operating economies; and the series as a whole will represent the most comprehensive study of this nature that has ever been made available to the railway industry.

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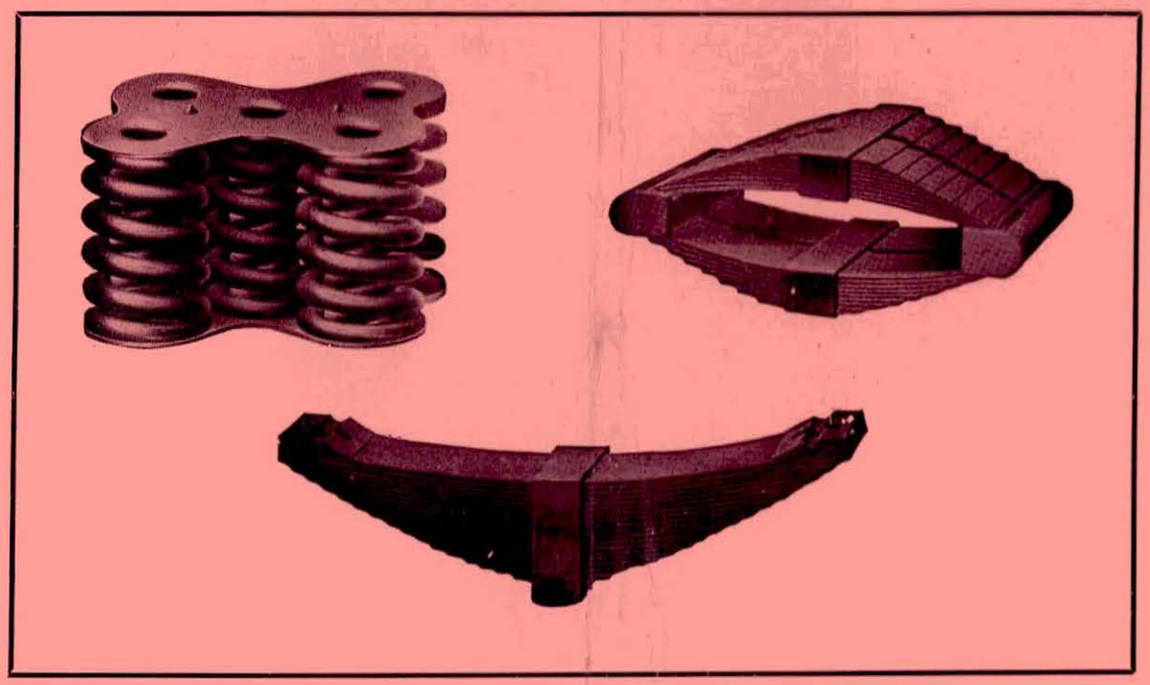

It just can't be done

Railroad Officials who approve the reclamation of springs in their own shops do not save money by doing so. It simply can't be done that way.

A repaired spring must be equal to a new one in uniformity and performance. Otherwise it throws parts out of alignment and unbalances the equalizing mechanism. To be equal to new it must be as carefully reworked and heat treated as a new spring. This involves too much costly machinery to be justified by the small volume in tonnage that any one railroad has to handle. It requires skilled workmen who are employed steadily at spring making. It should be directed by a well-rounded organization with every facility for advancing the art through constant research.

Seldom can a railroad justify this organization and equipment and so it is better in every way to send broken springs to us for reclamation.

"RAILWAY"

Railway Steel-Spring Company

30 CHURCH ST., NEW YORK

Branch Offices:

Chicago, Ill.	Detroit, Mich.	St. Louis, Mo.	Pittsburgh, Pa.	Montreal, Que.
St. Paul, Minn.	Washington, D. C.	Cleveland, Ohio	Denver Colo.	San Francisco, Cal

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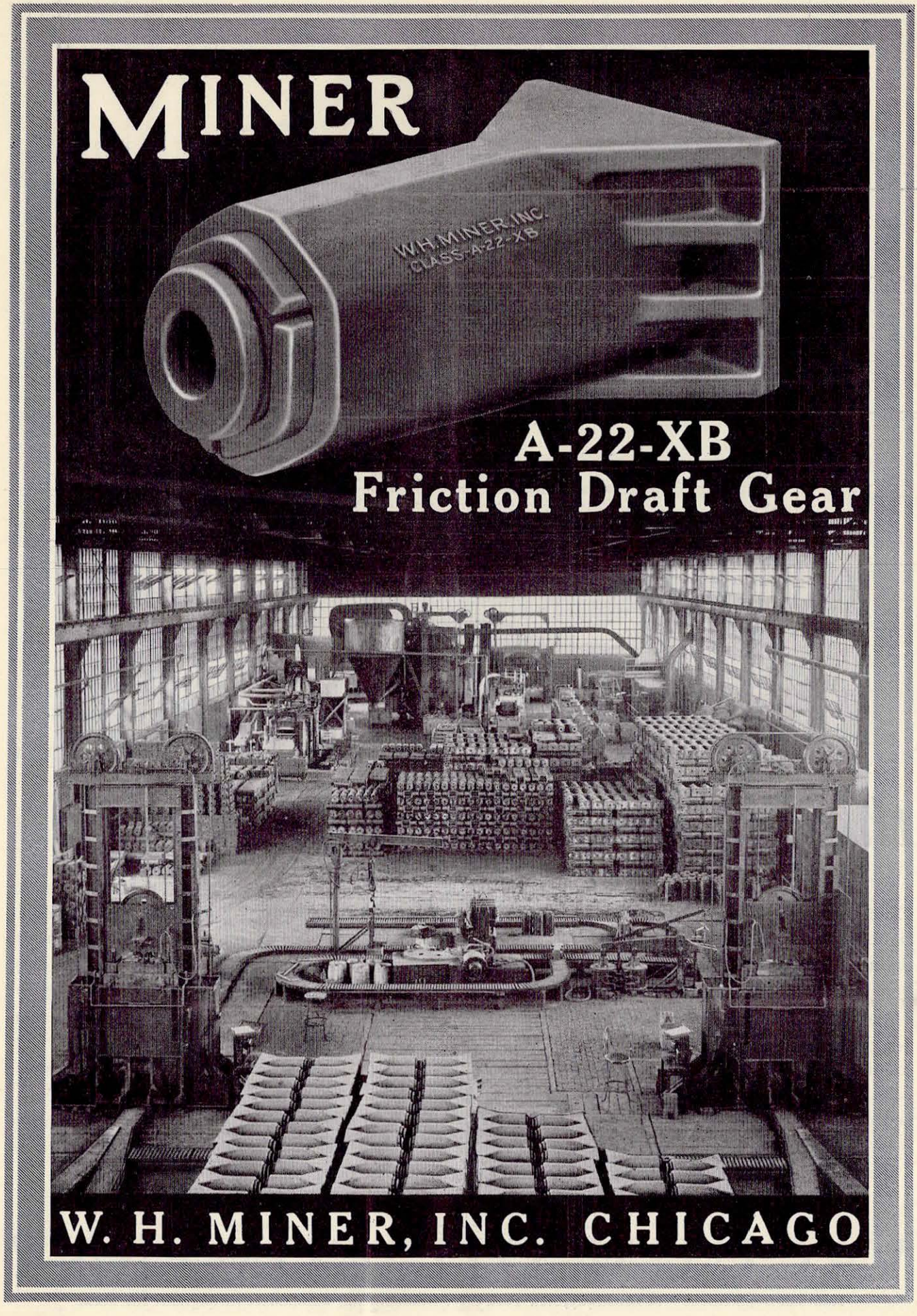
MINER
W.H.MINER,INC.
CLASS-A-22-XB
A-22-XB
Friction Draft Gear
W. H. MINER, INC. CHICAGO

3,000 such buses
operated by
100 Railroads

OPERATING COSTS...
the hub of the bus question

Economical operation of buses depends upon the right kind of lubrication. Repairs, replacements, maintenance, labor, time out of service, and depreciation, are less if lubrication is correct.

Leading bus operators choose Mobiloil and Gargoyle Bus Oils and Greases. 40 out of 130 manufacturers of passenger cars, taxicabs, and motor trucks attach plates endorsing the use of Vacuum Oil Company lubricants.

Railroad executives seek lubricants that will cut operating costs. Gargoyle Lubricants cut operating costs because they maintain correct body, do not wear out, have high oily character, resist heat, control carbon, do not gum.

For every railroad lubrication need, the Vacuum Oil Company provides a lubricant which is correct for its job, and expert counsel based on actual results.

A lubrication talk with a Vacuum Oil Company representative incurs no obligation.

GARGOYLE
Railroad Lubricants

VACUUM OIL COMPANY

Railroad Department · 61 Broadway, New York City. Branches and warehouses throughout the world

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Railway Age

With which are incorporated the Railway Review, the Railroad Gazette and the Railway Age-Gazette. Name Registered U. S. Patent Office

Vol. 91 July 11, 1931 No. 2

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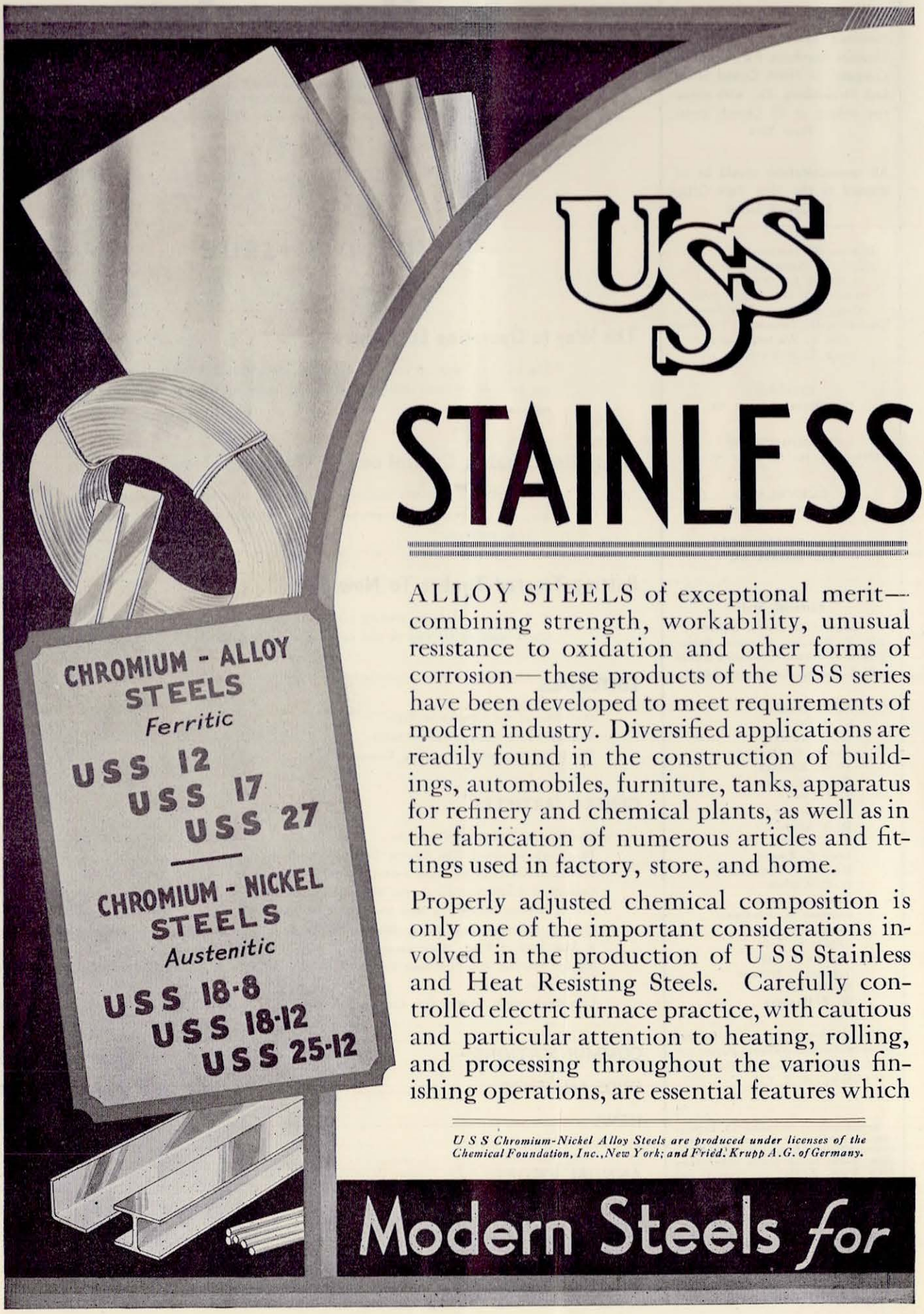
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CHROMIUM - ALLOY STEELS
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ALLOY STEELS of exceptional merit—combining strength, workability, unusual resistance to oxidation and other forms of corrosion—these products of the USS series have been developed to meet requirements of modern industry. Diversified applications are readily found in the construction of buildings, automobiles, furniture, tanks, apparatus for refinery and chemical plants, as well as in the fabrication of numerous articles and fittings used in factory, store, and home.
Properly adjusted chemical composition is only one of the important considerations involved in the production of USS Stainless and Heat Resisting Steels. Carefully controlled electric furnace practice, with cautious and particular attention to heating, rolling, and processing throughout the various finishing operations, are essential features which
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and HEAT RESISTING ALLOY STEELS

contribute a major share to the excellence of these alloy steel products.

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American Sheet and Tin Plate Company, Pittsburgh
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Typical Uses:

¶ **AUTOMOTIVE and AERONAUTIC**—For radiator shells, hub caps, lamps, bumpers, moldings, polished parts and fittings, hardware and trim, airplane parts and instruments.

¶ **MANUFACTURING and INDUSTRIAL**—Machinery and furnace parts, dampers, fans, preheaters, pumps, conveyors, turbine blades, nozzles, plungers, and machinery specialties.

¶ **CHEMICAL**—Vats, tanks, stills, digesters, condensers, retorts, paper and pulp manufacturing equipment, circulation systems, and laboratory apparatus.

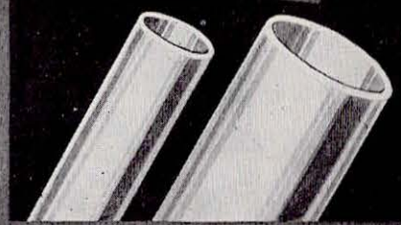
¶ **OIL REFINING**—Bubble caps, still tubes, linings, heat exchangers, ducts, containers, tanks, agitators, and other refining equipment.

¶ **FOOD HANDLING**—Pasteurizers, tables, hospital and hotel kitchen equipment, restaurant fixtures, cafeteria trays, food preserving and dairy machinery and accessories, ice cream and milk containers and utensils.

¶ **ARCHITECTURAL**—Structural members and supports, hinges and hardware, decorative metal embellishments, flat surface facings, moldings, doors, grilles, panels, and ornamental work.

¶ **HOME APPLIANCES**—Kitchen equipment, cooking and canning utensils, furniture, cabinets, electrical appliances, sinks, plumbing fittings, stoves, ranges, and tableware.

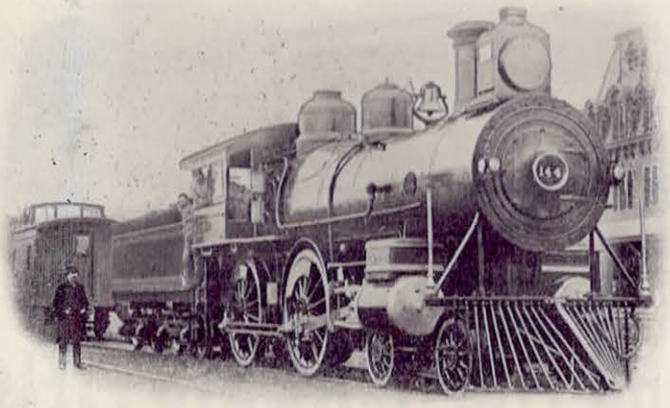
¶ **MISCELLANEOUS**—Packing house equipment, soda fountain counters and fixtures, display cases, humidors, handles, hooks, trays, golf clubs, skates, switch boards, metallic mirrors, laundry machinery, tank cars, railway car parts and fittings, and many other uses where beauty and resistance to corrosion are important factors.

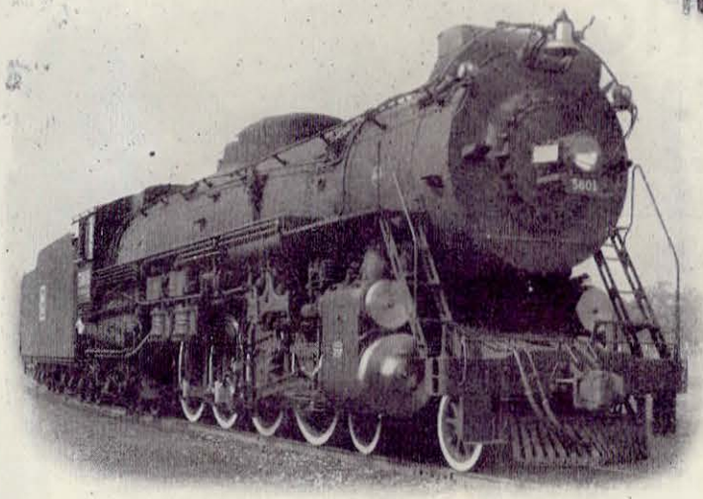


Modern Requirements

Motive Power Modernization A Question of First Importance

It would be poor economy to handle traffic with locomotives like this⟶





when locomotives (like the one illustrated on the left) of greatly increased capacity and efficiency are available.

IT is significant that a large percentage of the locomotives now out of service on account of light traffic conditions, are comparatively old. Trains are being handled by modern power which is kept in use because of its high efficiency and low maintenance cost.

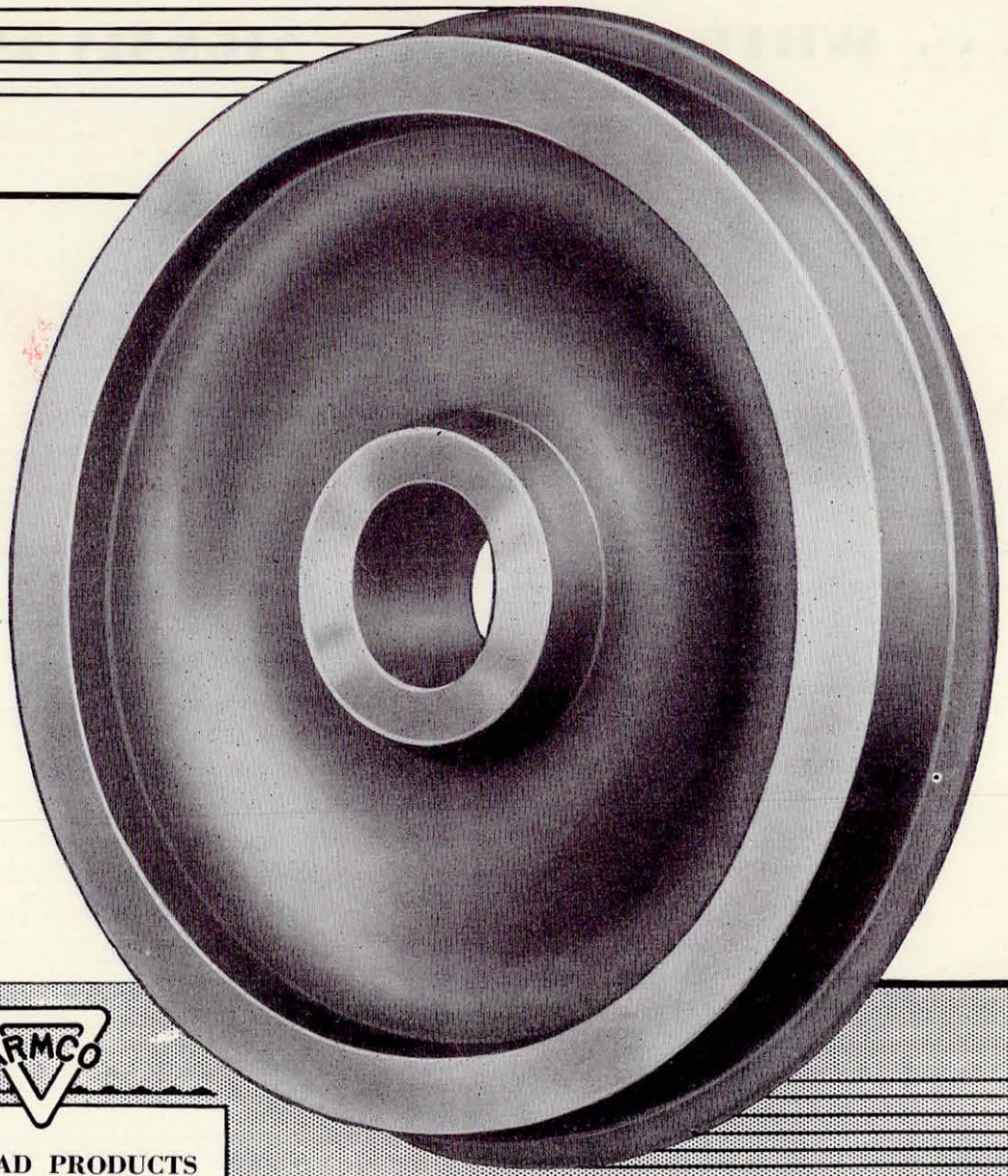
This is the opportune time for railroads to start replacing old power with strictly modern units, and be prepared to handle the increased traffic of the near future.

No expenditure could be made that would eventually yield more satisfactory returns.

We are prepared to discuss this question with any railroad.

THE BALDWIN LOCOMOTIVE WORKS 1831 1931

THE
BALDWIN
LOCOMOTIVE WORKS
PHILADELPHIA



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RAILROAD PRODUCTS

Special Car Siding Sheets

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Locomotive Jacket Sheets

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Freight Car Sheets and Plates

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Galvanized Ingot Iron and Steel Sheets

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Wrought Steel Wheels

ARMCO WROUGHT STEEL WHEELS

Armco Railroad Sales Co.

Executive Offices, Middletown, Ohio

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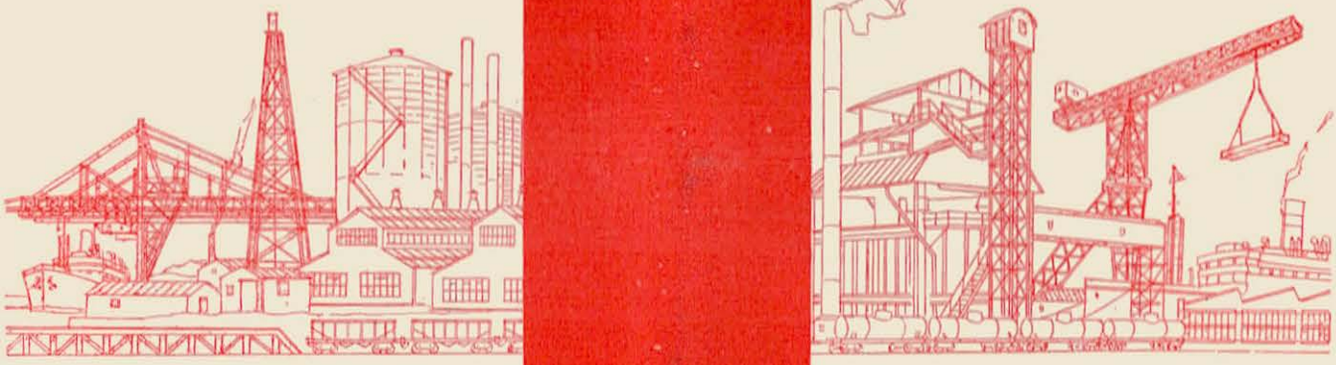
Chicago — New York — Philadelphia — Cleveland — St. Louis

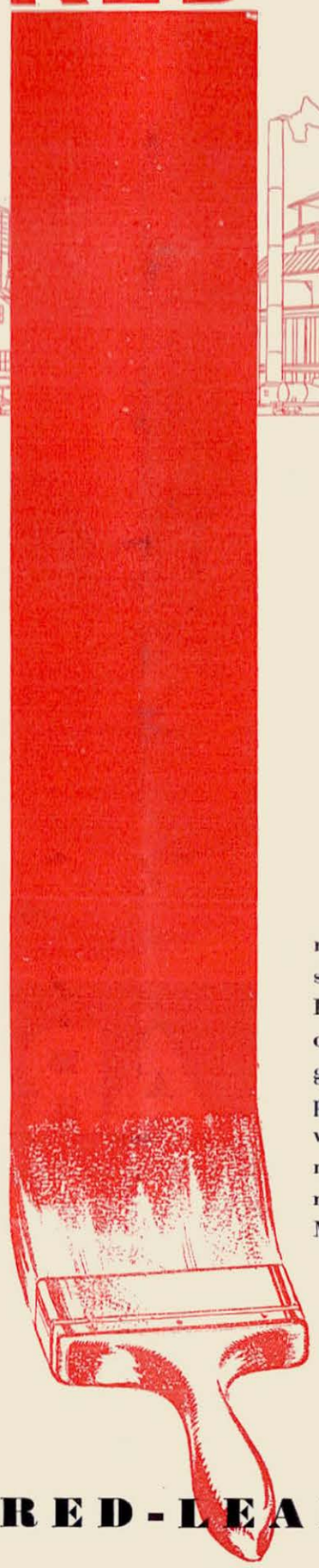
. . . WHERE RED SIGNALS SAFETY



STANDING out against the gray horizon like air beacons, red-leaded structures signal safety to invested capital. These vast areas of red-leaded surfaces bear mute testimony to the foresight of engineers and maintenance men who recognize in red-lead a sure means of protecting iron and steel against time, weather... corrosion.

Dutch Boy Red-Lead is a fine, uniform, highly oxidized pigment. It makes a paint that works easily...that furnishes an elastic, durable coating which sticks tight—to protect better—to wear longer.

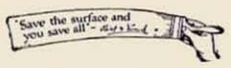
You can buy Dutch Boy Red-Lead in either paste or liquid form. The paste—Dutch Boy Red-Lead in oil—comes in natural orange-red and can be easily shaded to darker colors. Dutch Boy Liquid Red-Lead is supplied in six colors—orange-red, two shades each of green and brown, and black. Our Department of Technical Paint Service will be glad to help you solve your metal painting problems. Ask our nearest branch for booklet—"Structural Metal Painting."



DUTCH BOY RED-LEAD

NATIONAL LEAD COMPANY

New York, 111 Broadway—Buffalo, 116 Oak Street—Chicago, 900 West 18th Street—Cincinnati, 659 Freeman Avenue—Cleveland, 820 West Superior Ave.—St. Louis, 722 Chestnut St.—San Francisco, 2240-24th St.—Boston, National-Boston Lead Co., 800 Albany Street—Pittsburgh, National Lead & Oil Co. of Pa., 316 Fourth Avenue—Philadelphia, John T. Lewis & Bros. Co., Widener Building.



DAVIS "ONE-WEAR" STEEL WHEELS

KEEP THEM MOVING!

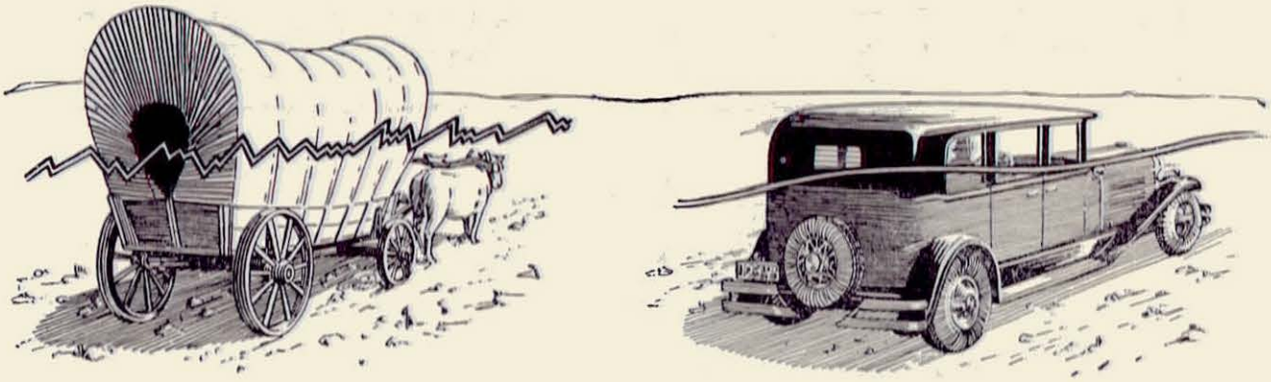
Keep cars moving! Moving cars mean revenue. At the lowest figure a car is worth a dollar a day. It wastes these dollars when out of service waiting for wheel re-turning • • • • •

One of the results of using Davis "One-Wear" Steel Wheels is to increase the availability of equipment by eliminating contour conditioning • • • • • • • • •

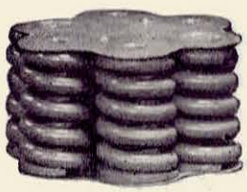
Davis "One-Wear" Steel Wheels are made from a special composition steel triple heat treated which enables them to develop full life without re-turning • • • • • • •

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS



Much of This
Difference in Riding Quality
Has Been Given to Freight Cars
by Bettendorf
Dalman-Type
Trucks

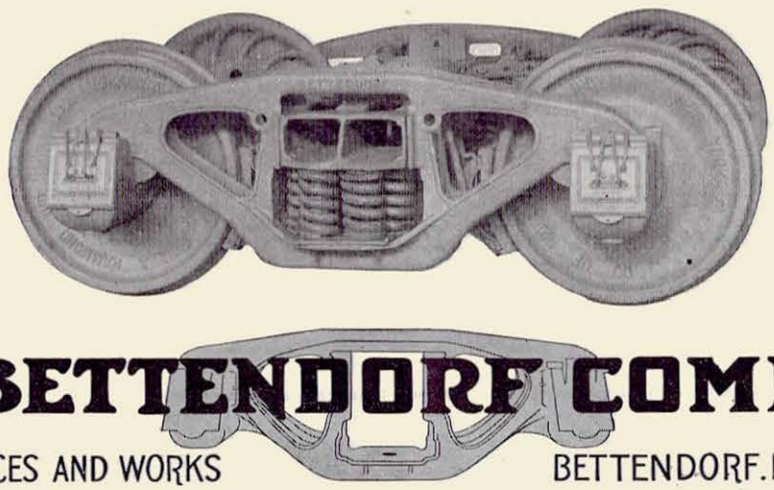


The Dalman spring group which gives Bettendorf Dalman-Type trucks ample reserve spring capacity and unusual shock absorbing ability, can now be furnished in a single cluster as illustrated above if desired.

The Dalman feature adds two standard coils to each spring group.

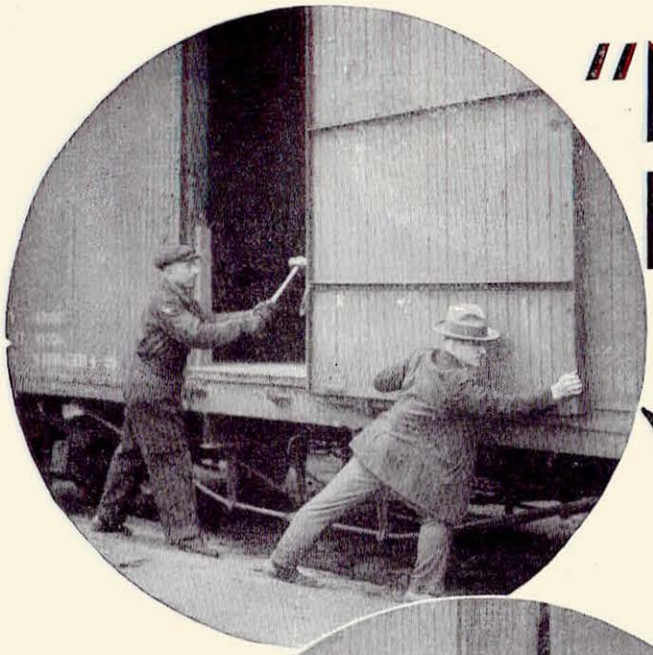
WHEN the covered wagon crossed the prairies, every stone and every chuck hole meant a distinct jar that brought fatigue to the intrepid souls aboard. Today the balloon tired automobile with scientifically designed spring suspension glides along with little thought to the contour of the road.

Much of this progress toward perfect roadability has been conferred upon the freight car by that highest development of freight car truck, the Bettendorf Dalman-Type. Your rolling stock is at its best when cushioned by the generous, scientifically arranged Dalman spring group. The economies inherent in the use of this improved equipment are obvious and considerable.



THE BETTENDORF COMPANY

OFFICES AND WORKS BETTENDORF, IOWA



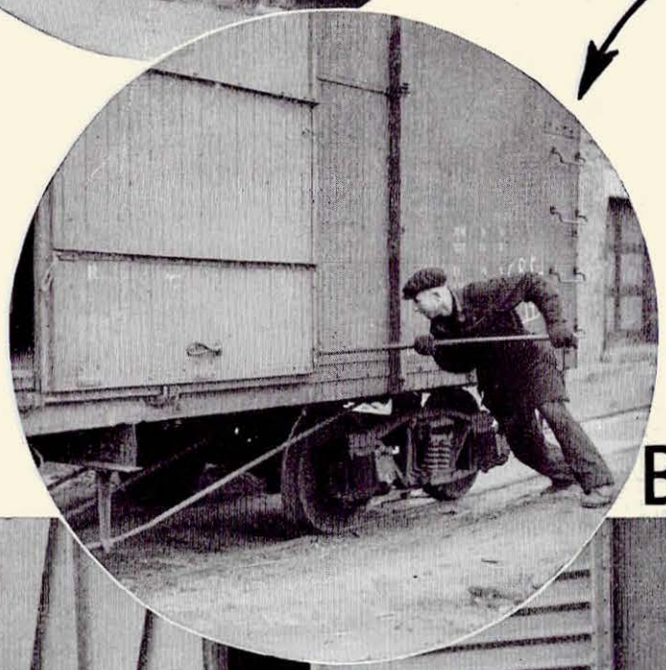
"Nothing Rolls Like a Ball"

You can get away from these conditions on Box and Automobile Cars . . . . . .

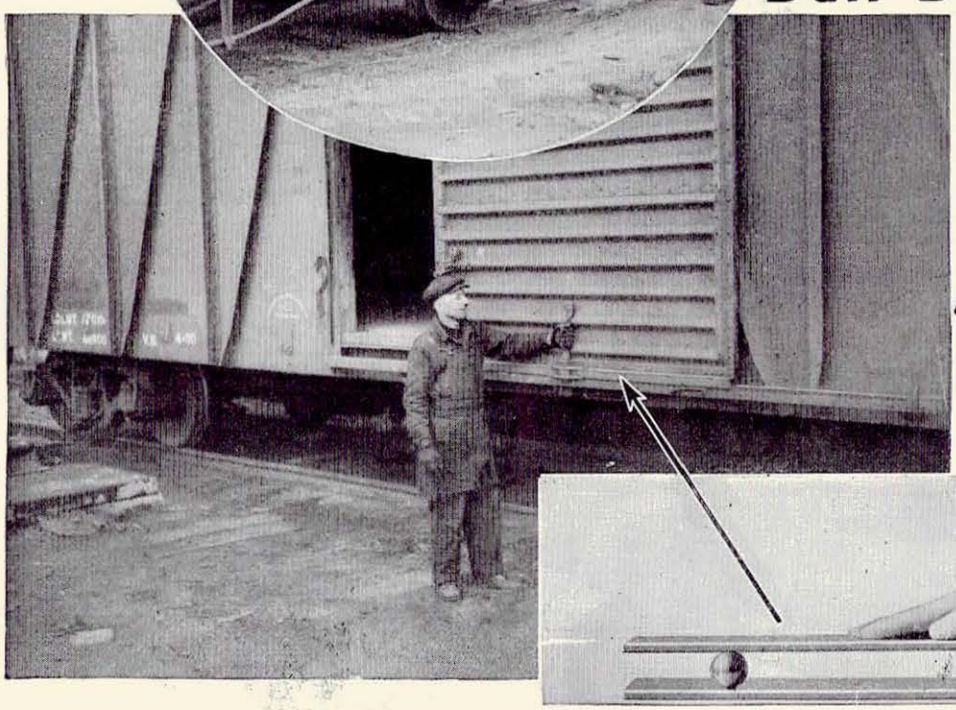
by using

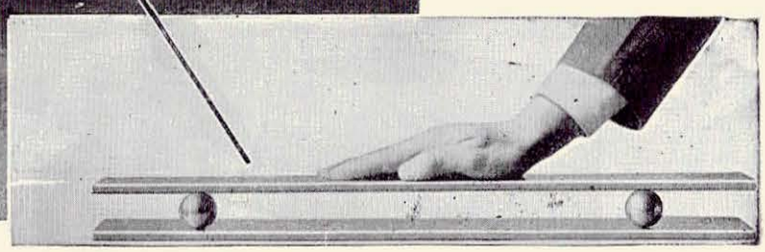
REO

Ball-Bearing Door Fixtures

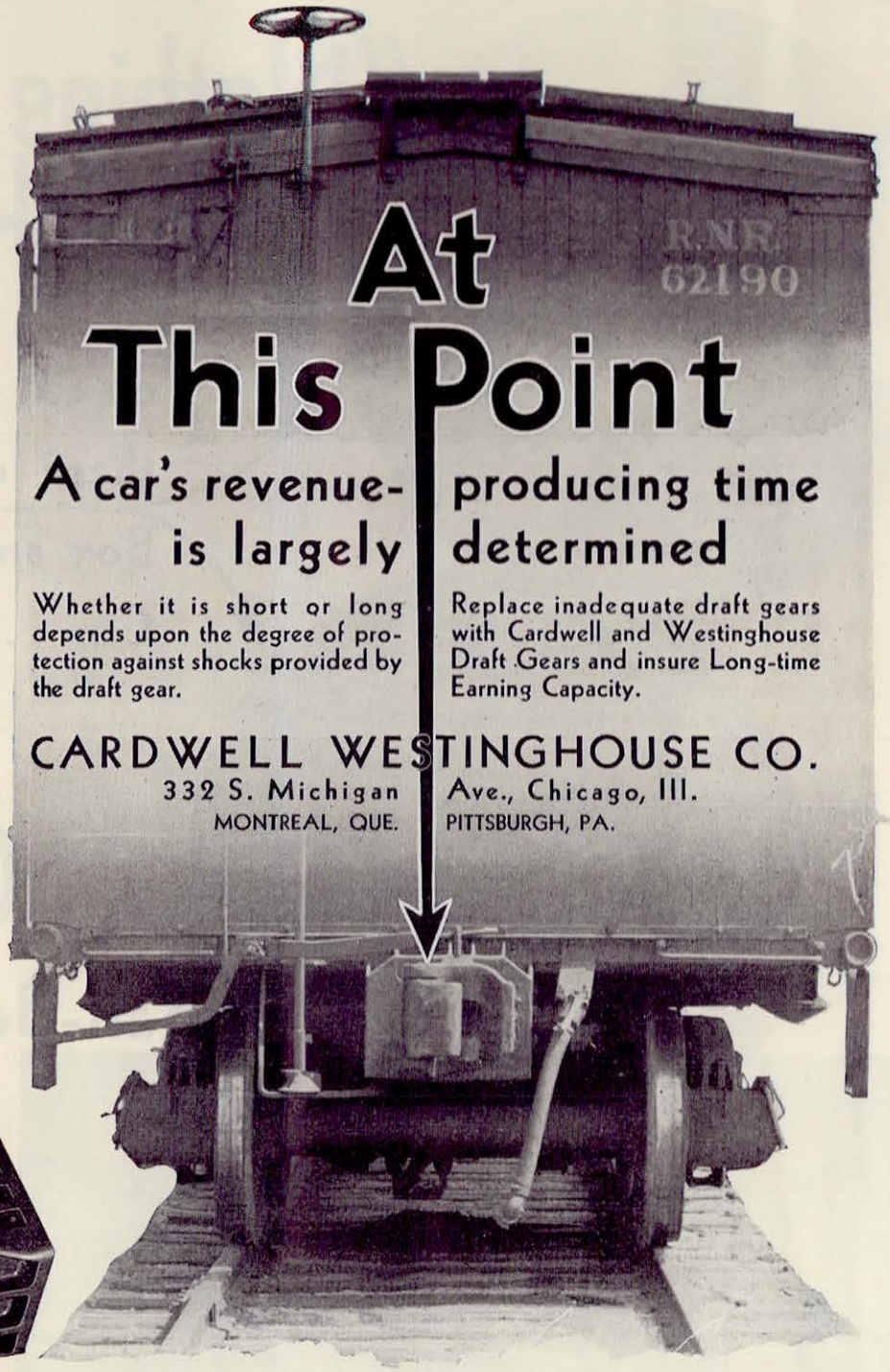


In Use on 36 Railroads





CHICAGO RAILWAY EQUIPMENT CO.
CHICAGO, ILLINOIS



At This Point

A car's revenue-producing time is largely determined

Whether it is short or long depends upon the degree of protection against shocks provided by the draft gear.

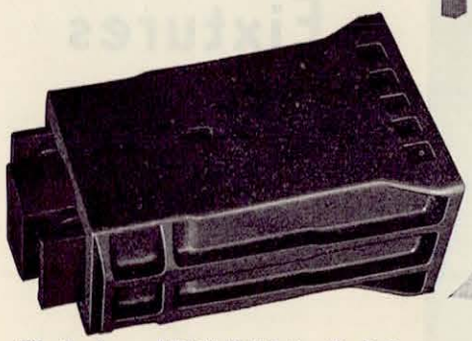
Replace inadequate draft gears with Cardwell and Westinghouse Draft Gears and insure Long-time Earning Capacity.

CARDWELL WESTINGHOUSE CO.

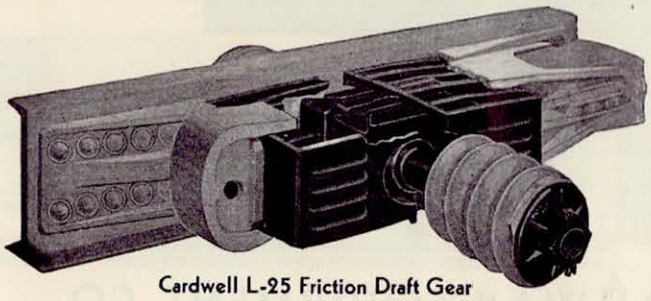
332 S. Michigan Ave., Chicago, Ill.
MONTREAL, QUE. PITTSBURGH, PA.

CARDWELL WESTINGHOUSE DRAFT GEARS

Made in types and designs to fit any kind of car construction or draft gear attachments on new or old equipment, and in sizes and capacities which meet all modern and A. R. A. requirements. » » » »

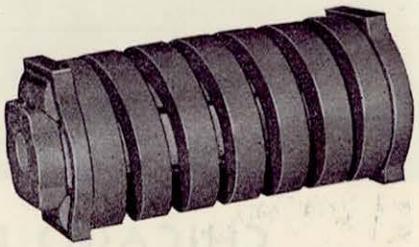


Westinghouse NY-11-D Friction Draft Gear



Cardwell L-25 Friction Draft Gear

Cardwell Westinghouse Friction Draft Gear Type F-2



GOOD DRAFT GEARS MAKE CARS GO FARTHER

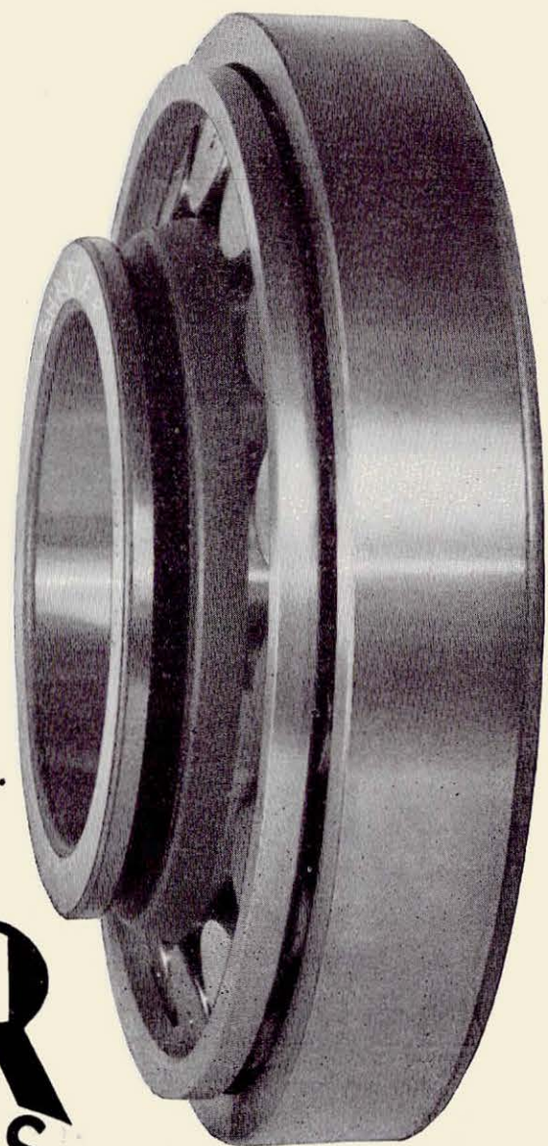
SHAFER *self-aligning action plus compact design*

are advantages of proved value in railroad service

This compact, effective design provides capacity for both thrust and radial loads, and maintains load bearing areas undiminished even in the presence of shaft deflection or misalignment.

The strength and stamina of Shafer Roller Bearings has been completely demonstrated by service on many prominent roads, including applications where loads are heavy and operating conditions unusually severe. The exclusive self-aligning principle of concave rollers and convex races give Shafer Bearings the extra capacity for the tough jobs.

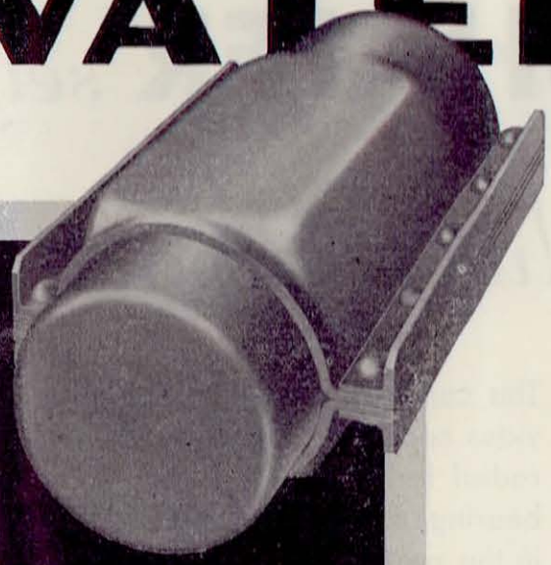
Examine this super-bearing design, see its free-rolling performance even at the extremes of the self-aligning action, and you will see why Shafer Roller Bearings are making such a remarkable record in railroad service. Shafer Bearing Corporation, 6501-99 W. Grand Ave., Chicago, Illinois.



SHAFER
SELF-ALIGNING
ROLLER BEARINGS

RA7-11 Gray

EDGEWATER



"Equipment PROTECTION not heretofore possible"

RING SPRING DRAFT GEAR

High protective efficiency, obtained by correct spring action—and positive release, is assured by the principle of the Ring Spring Draft Gear—and the high quality of the materials and workmanship embodied in its construction.

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PITTSBURGH PENNSYLVANIA

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Baltimore, Md.
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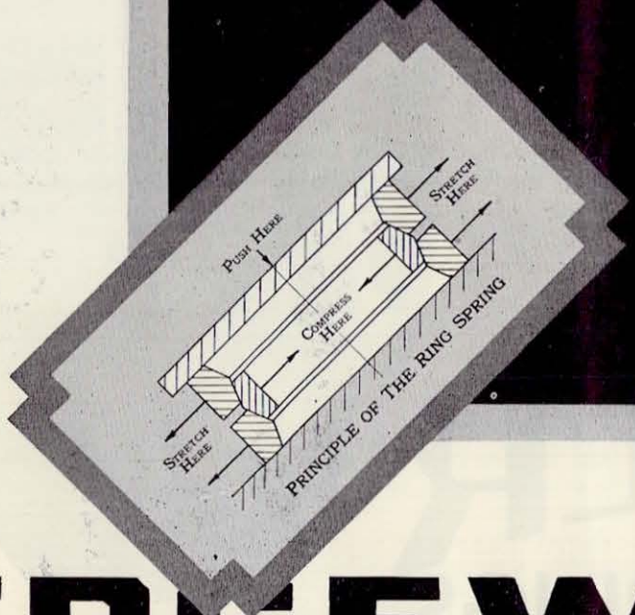
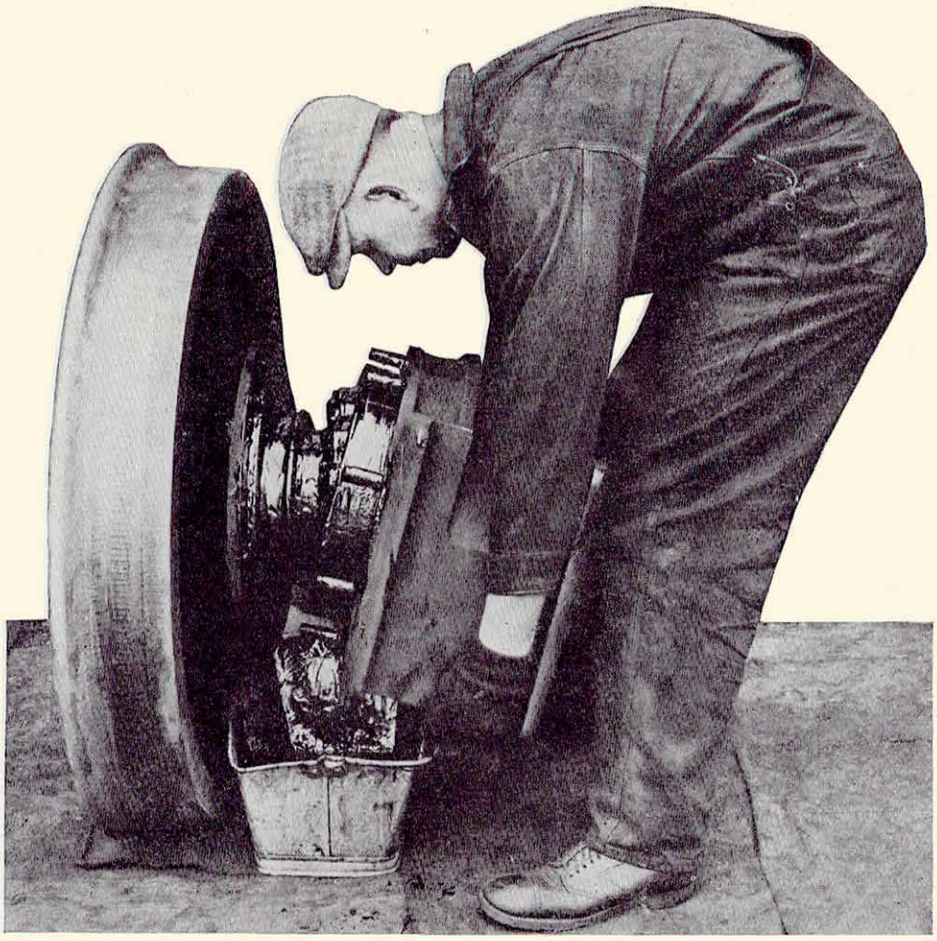


EDGEWATER



Due to SKF dependability the bearings run from shopping to shopping without inspection

"GET-AT-ABLE"

—A *Quality of* SKF Bearings

CONSIDER anti-friction bearings from the standpoint of accessibility and SKF heads the list.

Whether on car journals or engine trucks the SKF bearing is easily inspected and quickly disassembled.

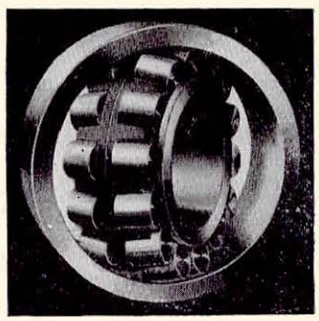
Just remove a few bolts and take off the journal box by hand. Both races and all the rollers can then be minutely examined without disturbing the mounting of the bearing on the journal.

The bearing itself can be removed by unscrewing the locking nut and withdrawing the tapered sleeve. Since it is not necessary to press off the bearing there is no injury to the fit between the bearing and axle and the bearing can be removed at any time without the necessity of turning seats or removing wheels.

Even on the engine truck, the inboard bearing can be quickly inspected by loosening a few bolts and removing the lower half of the journal box.

This ease of inspection of SKF Journal Bearings not only saves money at shopping periods but it encourages the thorough "going-over" that keeps you assured of freedom from bearing trouble on the road.

2749



SKF INDUSTRIES, INCORPORATED

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"STANDARD S-302"

NORMALIZED and TEMPERED HIGH TEST STEEL

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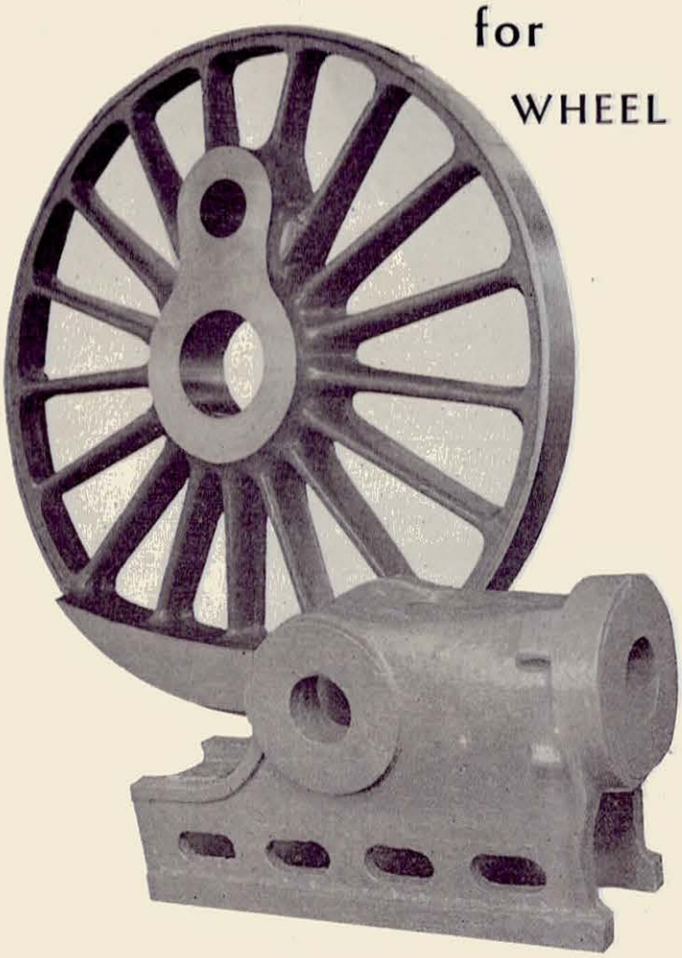

CROSS HEADS

Specify "STANDARD S-302-31"

Tensile Strength	85,000	Elongation	22
Yield Point	50,000	Reduction	35

A High Test Steel Casting . . . Without Alloys. You will be surprised at the slight additional cost.

STANDARD STEEL WORKS COMPANY

GENERAL OFFICES AND WORKS:—BURNHAM, PA.

CHICAGO RICHMOND ST. LOUIS PORTLAND
NEW YORK PHILADELPHIA SAN FRANCISCO AKRON

Interesting new Milwaukee diner is equipped with Timken Bearings

Perpetuating the name of Dan Healey, famed Milwaukee Road steward of days gone by, this new diner is also representative of a new standard of dining car luxury and comfort.

It is mounted on Timken Bearings to give the smooth, joltless riding ease and hot-box-free dependability associated with Timkens in so many other famous units on the Milwaukee Road. Two cars of this type were recently placed in service.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN

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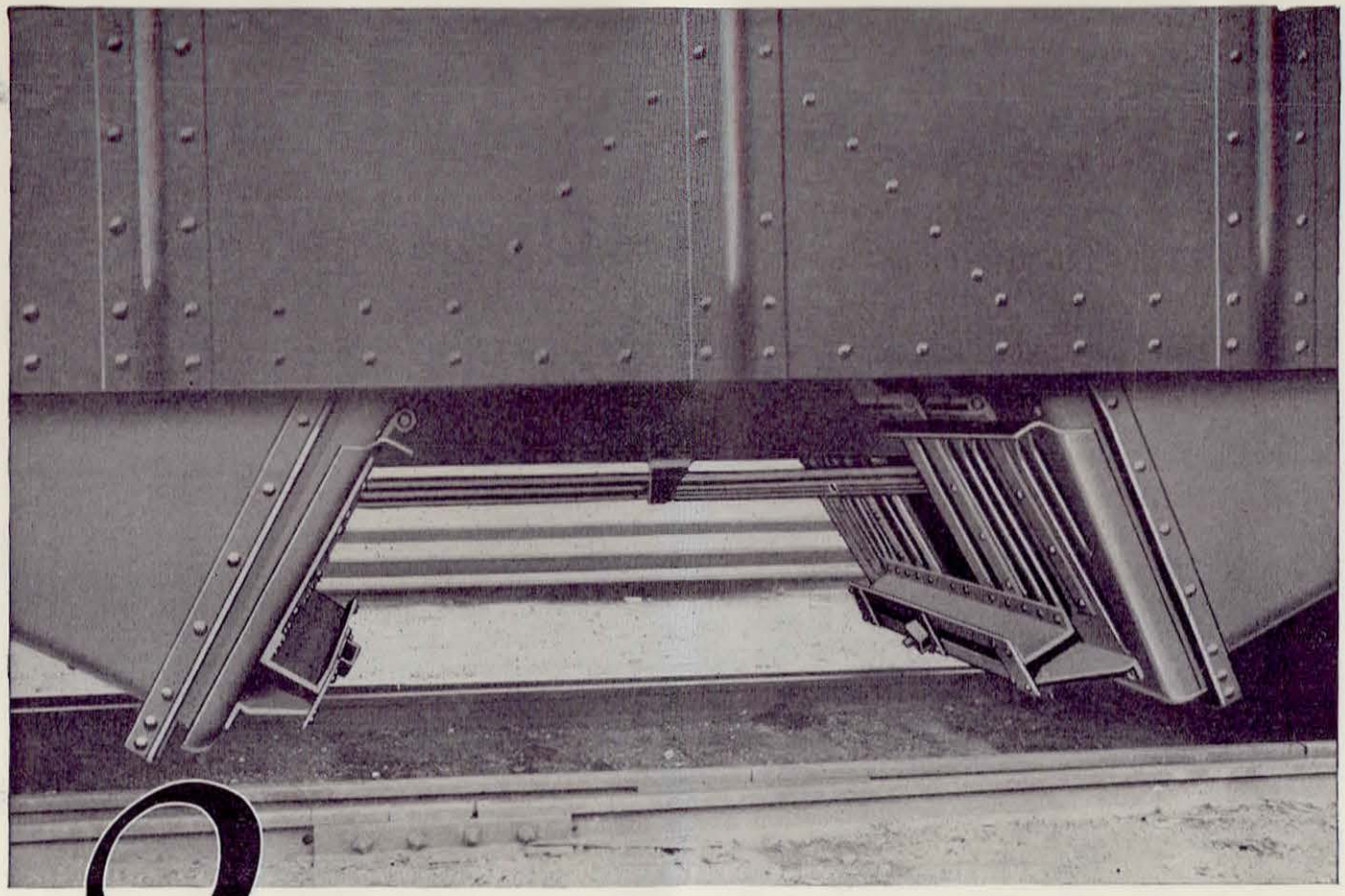

Utilization

Corrugating a flat plate increases both its strength and resilience. This condition is ideally utilized in Ajax Corrugated Doors which combine these features to withstand present day loading practices.

AJAX CORRUGATED DROP DOORS

UNION METAL PRODUCTS CO.

NEW YORK CHICAGO ST. LOUIS
WASHINGTON RICHMOND HOUSTON
SAN FRANCISCO KANSAS CITY
MONTREAL

One of the two new 4-8-4 type locomotives of the Lehigh Valley, equipped with Carbon-Vanadium Steel main rods and side rods, photographed at Oak Island Yards, near Jersey City.

Main Rods and Side Rods Of Carbon-Vanadium Steel

On New Freight Locomotives Of the Lehigh Valley

LATE in March, the Lehigh Valley Railroad Company placed in service two 4-8-4 type locomotives for operation between the Canadian frontier and tidewater at Jersey City, N. J. The locomotives, one built by American Locomotive Company and the other by The Baldwin Locomotive Works, were designed to handle merchandise trains of 3,000 tons in fast freight service with a minimum of helper operation.

Like many modern locomotives built in recent years, these new 4-8-4 type locomotives are equipped with Carbon-Vanadium Steel in main rods and side rods. It provides the essential strength, toughness and durability that insures continuous, dependable rod service, with freedom from maintenance and failures.

Every locomotive, for freight, passenger or switching service, needs Carbon-Vanadium Steel in revolving and reciprocating forgings. Its useful strength is 50% greater than carbon steel, its shock-resisting and anti-fatigue properties are correspondingly higher. Its superior physical properties can be employed to provide greater forging stamina, or to reduce forging weight without sacrifice of safety. Moreover, Carbon-Vanadium Steel is easily handled, for it requires no quenching and tempering. Complete data on Carbon-Vanadium Steel will be sent promptly, if you will write us.

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120 BROADWAY, NEW YORK, N. Y.

CHICAGO *Straus Bldg.* PITTSBURGH *Oliver Bldg.* DETROIT *Book Tower*

Plants at Bridgeville, Pa., and Niagara Falls, N. Y.
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FERRO-ALLOYS of vanadium, silicon, chromium and titanium; silico-manganese, tungsten and molybdenum, produced by the Vanadium Corporation of America, are used by steel makers in the production of high-quality steels.

VANADIUM STEELS

for strength, toughness and durability

Less Than One Cent

per roof per year for maintenance

THE cost of roof maintenance, from 1913 to 1930 inclusive, on 30,000 Canadian National cars equipped with Dry Lading Roofs, amounted to $4,519.49.

The average maintenance cost per roof, per year, during this 18 year period, amounted to less than one cent.

This remarkable record is indicative of efficient management and a deserved reward of far-sighted vision.

It expresses the value of Dry Lading Roofs in terms of long trouble-free service and dollars and cents savings.

It proves that there is a vast difference between the mere purchase of roofs and really investing in a long term weather-proof roof service.

It proves that low price does not mean low cost but long service does. It's the cost per year that counts.

You cannot get around years of actual records. The Universal Dry Lading Roof is the greatest economical improvement in car construction.

Hutchins Car Roofing Company

Discussion of the Advance in Rates

The tone of public discussion of the proposed general advance in freight rates is remarkable. We have read many newspaper and magazine editorials and statements of business men and public men upon this subject. In very few of them have appeared the time-worn criticisms of the railways for alleged unsound financing and unfair treatment of the public. In most of them there has been frank recognition that the service of the railways has been greatly improved, that they have been unfairly treated in many ways, and that they are in a serious financial condition. Many newspapers emphatically endorse the application for an advance in rates and declare it should be granted, both to protect the railroads and to stimulate general business. Many, on the other hand, question the desirability of an advance in rates, the reason most often given being that, because of the outside competition to which the railways are subject, it might drive traffic from them and cause them to lose more revenues than they would gain. The preponderance of business and public sentiment undoubtedly favors the advance in rates both as a means of saving many railways from disaster and of helping revive general business.

Politics Injected Into the Case

As might be expected, some public men have expressed themselves against an advance, especially upon farm products. Senator Capper of Kansas has written a letter to the chairman of the Interstate Commerce Commission against it. Senator Thomas of Idaho, after saying, "I do not want to be understood as being hostile to the carriers", added, in an interview appearing in the Boise Statesman, "Now, when our mines, lumbermen, livestock men and farmers are suffering as they are, it is unjust for the railroads even to think of asking for a rate increase. Such an increase would result in decreasing their business more than ever and driving it to the truck lines". He expressed the hope that farm organizations, public utilities commissions, and the various chambers of commerce "will cooperate with us in Washington in opposing the plea of the railroads for a higher rate". Secretary of Agriculture Hyde, in an address at Indianapolis, said he ventured to hope that the Interstate Commerce Commission would take into consideration various matters, and so phrased his statements as to cause them to be quoted as an argument against advances on agricultural products.

The Interstate Commerce Commission is supposed to be left free from political influence. Just how free it is from such influence is indicated by the expressions of these public men. Members of the commission are appointed by the president and confirmed by the Senate. Secretary Hyde's statement naturally has been construed as a warning to the commission that the administration is opposed to an advance in rates, at least upon agricultural products. The statements of Senators Capper and Thomas could easily be construed as indicating that they would not look with favor upon confirmation of the reappointment of any member of the commission who voted for an advance in rates.

The railroads obviously must either have advances of rates or reductions of wages. If Secretary Hyde's statement reflects the attitude of the administration, has President Hoover changed his mind regarding reductions of wages? It would be quite as appropriate for the president, who appoints members of the Interstate Commerce Commission, to state publicly his attitude toward the proposed advance in rates as it is for his secretary of agriculture and United States senators to state theirs.

When Doctors Disagree—A Fable

The railroads are a sick industry. A fable might be written about what is now occurring and will occur if those who concede that the railroads need help, but oppose the advance in rates for which the railway executives have asked, are successful. Such a fable might read as follows: "Mr. Railroad System was very sick. Doctor Railway Executive, Doctor Statesman, Doctor Editor and Doctor Business Man were called in consultation with Doctor Commission, who was in charge of the case. They agreed in diagnosing the patient's trouble as creeping starvation, and Doctor Railway Executive advised Doctor Commission to feed him more revenues. The other consultants all

opposed giving him more revenues, and, although they suggested no other treatment, Doctor Commission followed their advice. All the doctors were deeply pained, and all excepting Doctor Railway Executive were greatly surprised, when the patient died, but the others put all the responsibility for this grievous outcome upon Doctor Railway Executive because he had not been able to think of any thing to do for a starving patient except to feed him more."

The apprehension so often expressed that an advance in rates would not increase railway revenues because it would drive so much traffic to other carriers is exaggerated. What traffic can bear higher rates can be determined only by actual test; but after a general advance the railways undoubtedly would initiate downward readjustments where needed to hold large amounts of traffic. Spokesmen of some industries, and especially of agriculture, say that they are worse off than the railways, and that therefore they should not be required to pay higher rates to help the railways. The railways did not do as well during recent years of prosperity as most other industries; but that was not accepted then as a valid argument for advancing rates. It is impossible to compare in detail conditions in all industries at the present time and decide which are relatively the worst off.

It is unquestionably a fact that the railroads are among those that are worst off. Almost nobody questions that they need more revenues. Their executives are responsible for their management and not for that of other industries, and know more about their condition than about that of any other industry. Their executives having assumed the responsibility of asking for a general advance of 15 per cent in freight rates, it is but reasonable to assume that they have considered all phases of the matter and are convinced that this is the best way to get the additional revenues needed. Representatives of other industrial and commercial interests who believe that, in the public interest, the railways should not be given larger revenues, or that a general advance in rates is not the best way to provide them, are within their rights in saying so. They have the same responsibility and duty to their industries that railway executives have to the railroad industry.

An Unprecedented Railway Situation

But what should be said of the course of public men such as Secretary Hyde and Senators Capper and Thomas in communicating to the commission their opposition to advances in rates in advance of any hearings? They could have shown whether they really know anything about the merits of the case by appearing as witnesses before the commission and having the fairness and intelligence of their views subjected to the test of cross examination. By commenting upon it as they already have, they have shown that they are not trying to use the influence of facts and reason upon the commission, but the influence of politics, and that they would rather see numerous railroads drift into bankruptcy than have the commission decide that these bankruptcies would be worse for the nation than an advance in freight rates.

The present railway situation is different from any that ever existed before. Never until the present depression was the traffic of American railroads smaller than ten years before, and therefore never before did the railroads ask for an advance in rates under such conditions as now exist. Consequently, the Interstate Commerce Commission is confronted with a problem such as it was never anticipated would ever be presented to any railroad regulating body. It is essentially an economic problem, which the commission should do its best to solve in that way which will promote the economic welfare of the nation. The injection of politics into the case shows that those who inject it either do not know that the railway situation presents a national economic problem of vital importance, or do not care anything about that problem excepting as a means of promoting their political interests.

Railway Police Achieve Against Odds

A prolonged period of extensive unemployment in the United States practically always brings with it an increase in crime, with a consequent increase in the number of thieves who commit depredations upon railroad property and freight in transit. That factor alone has added materially to the duties of the railway police departments in 1930 and 1931. Other factors, such as an increased consumption of tobacco and cigarettes, commodities that rank high in the ease with which they may be disposed of by thieves, further added to the responsibilities of the special agents.

Traffic decreased and the police department forces, along with the rest, were reduced. But when freight claim payments attributable to thefts and robberies increase 30.7 per cent in one year, as they did in 1930, and continue with an increase of 30.7 per cent in the first four months of the year, as they did in 1931 as compared with 1930, it promotes the obvious thought that special agents' forces have been pared too drastically.

Freight claim officers, who by the very nature of their work are constantly feeling the pulse of the claim reduction movement, are inclined to be quite outspoken in their view of the situation. One such officer said at the recent Protective Section meeting that, "if there ever was a time when police forces should be maintained at normal, it is the present."

Thieves who prey upon railroad property and pilfer

freight stored or in transit, have improved their methods just as have other types of criminals by the use of such modern devices as the motor car and truck. If robbery claim payments are to be kept below the total of 1929, a year of a great volume of freight traffic, and police forces are not to be generally augmented, some other method of increasing the efficiency of the remaining officers must be found. That is not meant to imply that railway police departments have not increased their effectiveness, because since 1920 there has been a decrease in robbery payments of 92.2 per cent.

The Great Problem of Operating Economies

In time the present crisis in railway affairs will pass. Whether it will be marked by numerous railroad bankruptcies may be determined by the decision of the Interstate Commerce Commission in the pending 15 per cent rate advance case; but sooner or later general business will revive, traffic will increase, and the problems now made paramount by the depression will be replaced by problems made paramount by different conditions. Probably the problems created by the competition of other means of transportation will be rendered less difficult by changes in the government policies applied to different classes of carriers.

There is one problem, however, that railway managements always have had, have now and always will have in future. It will be presented to them in a more difficult form during the next period of good general business than it ever was in any similar past period. This is the problem of effecting permanent economies in operation—the problem of reducing the cost of carrying a passenger one mile and a ton one mile. It will be both more difficult and more essential to solve this problem in future than it ever was before.

There is a wide difference between retrenching, and reducing operating costs. For more than a year railway managements have been effecting drastic retrenchments; but many of these are temporary, and, in the long run, expensive. Permanent economies can be effected only by permanently reducing the amount of labor, fuel and materials used in producing a given number of passenger miles and ton miles of transportation.

Throughout the first ninety years of our railway history there were constant and large increases, excepting during years of depression, in the volume of passenger and freight business. These increases in volume usually would have almost automatically reduced unit costs, and they were supplemented by improvements in equipment, facilities and methods. In consequence, unit costs of transportation usually declined, even in spite of advances in wages and prices.

After the present depression passes freight business will recover, but experience during the last decade forbids the expectation that increases in the volume of traffic will contribute as in the past toward reductions in unit costs. Furthermore, unless there are to be increases in commodity prices that now seem improbable the railways cannot hope to get more than temporary relief from advances in rates. To derive adequate net operating income from their prospective total earnings they will have to effect large and increasing economies in operation.

A Challenge to Manufacturers

Methods of operation can and will be improved. But no great improvement in methods of railway operation ever has been effected without being supplemented by and largely based upon improvements in equipment and other parts of the physical plant. These improvements in the physical plant, as is pointed out in an article entitled "The Way to Operating Economies," which is published elsewhere in this issue, have been initiated largely or mainly by the great railway equipment and supply manufacturing industry of the country. Our railways have done comparatively little manufacturing for themselves. This has been fortunate for them, for their principal officers always have been too much preoccupied with the major problems of railroad development and administration to have initiated and carried out the improvements in physical facilities essential to the improvements in service and the economies in operation that have been effected. The same undoubtedly will be true in the future

The present railway situation therefore presents a challenge, not only to railway managements, but to the railway equipment and supply manufacturing industry. Past developments in the art of railway transportation have, year after year and decade after decade, made obsolete the facilities with which railway service previously had been rendered. The most vital necessity of the future will be that of making obsolete most parts of the present railway plant. With their present facilities the railways can and do carry freight more economically than ever before, but railway facilities must be so greatly improved that future economy of operation will far surpass the economy of the present.

Periods of depression are the times to prepare for prosperity—the times for both railway managements

ment of methods, but it is difficult, if not impossible, to single out any one measure for the attainment of important economies in operation that has not entailed or will not entail some substantial initial expenditure for improved equipment, better materials, betterments or additions to the fixed property, or power-operated machinery.

Thorough-going supervision will insure that trains are made up to full tonnage rating, but no marked decrease in the cost of moving a given volume of traffic can be effected without an increase in train loads that involves much more than improvement in methods. It requires grade reductions or more powerful locomotives or both; cars of greater capacity; and longer trains cannot be handled efficiently without better brake equipment, stronger draft rigging, and longer yard and passing tracks. It is now generally conceded that a real test of efficiency in transportation must take into account the element of time as measured by such units as ton-miles per train-hour and ton-miles per car-day, and to effect improvements in performance as tested by these units calls for locomotives embodying a combination of many of the elements formerly confined to the freight locomotives on the one hand and the passenger locomotives on the other. In addition, it demands better signaling equipment to insure that trains are not delayed unnecessarily on the road, larger tender cisterns and coal spaces and adequate classification yards.

Other Opportunities for Economy

There are also many fields for economies in operation that have no direct bearing on the relation of ton-miles to train-hours, namely, means for reducing the man-hours and quantities of materials, fuel and supplies required for the movement of traffic and the maintenance of the property. And here again the answer is to be found almost entirely in the acquisition of new or improved facilities and equipment. In the maintenance of tracks alone, at least a dozen entirely new power devices, and an equal number of adaptations of equipment previously employed for other purposes, are now available for the performance of operations that were carried on almost entirely by hand only a few years ago. In the operation of trains, centralized control has demonstrated its ability not only to expedite train movement, but to effect marked economies in man power, while in terminal operation the car retarder speeds up the classification of trains while greatly curtailing the yard forces.

Brief reference has already been made to the influence of the modern locomotive on economy in train operation, but advance in locomotive design and construction has been by no means confined to the attainment of greater power and speed. While progress in locomotive design, characterized by such elements as greater size and power, the automatic stoker and the superheater, has extended over a large portion of the present century, improvement has continued apace, and the locomotive of today is a far more efficient machine than its counterpart of only five or six years ago. The introduction of the four-wheel trailer permits of larger grate areas and a better distribution of wheel loads on the track, high strength steels allow higher boiler pressure without a proportionate increase in weight, etc. With these improvements and the feed-water heater, the booster, the cast-steel engine bed and integrally cast cylinders, and other refinements in design and construction, the locomotive of today is not only possessed of greater power and capable of greater speeds under full loads, but operates with greater fuel economy and for longer mileages between shoppings.

Really modern locomotives of the greatest efficiency are only a small part of those now in service, and the economies that can be effected by replacing all obsolete locomotives with the more modern and efficient types are very large. No better evidence of the superior performance of the modern locomotive is to be had than that afforded by the results obtained during the present curtailment of traffic by those railroads which have been in a position to handle practically all trains with power of recent purchase.

The Manufacturer's Influence

While locomotives and power track tools have little in common, mention of these two widely different classes of railway appliances serves to emphasize the scope of the manufacturer's influence on the efficiency and economy of railway transportation; in fact, it is almost impossible to mention any phase of railroad operation, whether it concerns the delivery of coal to locomotives or the dispatching of way bills at a yard, that has not felt the potent touch of inventive genius and business enterprise brought to bear by some branch of the railway equipment and supply manufacturing industry.

In some instances, as in the case of the car retarder, the basic idea was conceived in the mind of a railway officer, but, on the whole, modern railway appliances, like nearly all industrial advance of the present day, are the product of research and development work in the drafting room laboratory and test rack of the manufacturer. And even a device evolved by an officer of a railway is subjected to extensive and costly development by the supply company before its economic potentialities can be effectually realized.

This is not said in depreciation of the part played by the railways in their development, for without painstaking service tests and constructive criticism on the part of railway officers, few mechanical appliances now in use would have attained the success they now enjoy. Moreover, many railway officers have virtually staked their reputations in recommending the purchase of expensive equipment of great potential but unproved merit. The manufacturers, however, have not only staked reputations but, in many cases, also large sums of money in the experimental work necessary for the perfection of appliances and in subsequent promotional effort before a dollar of profit was realized.

A Real Incentive

That such enthusiasm has been justified is evidenced by the outstanding progress that has been made in the application of power appliances and in the replacement of obsolete equipment with new units of greater efficiency. Supply manufacturers have had the courage to continue their development work because they have known that the railway managements gladly entertain suggestions that promise operating economies, and are ready to make expenditures for improvements if they promise an adequate return on the investment.

The *Railway Age* has long assumed as one of its primary duties that of apprising its readers not only of the current developments in appliances designed to improve railway service and effect economies in operation, but also of recording the progress made in their application and the results that have accrued from effective utilization. This record, spread over the pages of *Railway Age,* from year to year, although constituting a current history of railway progress, is neces-

freight stored or in transit, have improved their methods just as have other types of criminals by the use of such modern devices as the motor car and truck. If robbery claim payments are to be kept below the total of 1929, a year of a great volume of freight traffic, and police forces are not to be generally augmented, some other method of increasing the efficiency of the remaining officers must be found. That is not meant to imply that railway police departments have not increased their effectiveness, because since 1920 there has been a decrease in robbery payments of 92.2 per cent.

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After the present depression passes freight business will recover, but experience during the last decade forbids the expectation that increases in the volume of traffic will contribute as in the past toward reductions in unit costs. Furthermore, unless there are to be increases in commodity prices that now seem improbable the railways cannot hope to get more than temporary relief from advances in rates. To derive adequate net operating income from their prospective total earnings they will have to effect large and increasing economies in operation.

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and manufacturers to be studying and deciding upon means by which the maximum improvements in service and the maximum economies in operation can be effected when general business revives. The equipment and supply manufacturing industry already has available many kinds of improved equipment, devices and materials that already are being used enough to demonstrate that their general use on all the railways would result in huge economies. For example, if all the locomotives now owned by the railways were as good as the best that they own, the economy with which the freight traffic that will be available after business revives would be moved would be much greater than the economy with which it could be moved with all the locomotives now owned.

The Railway Age's Program

In order to help concentrate attention upon economies in operation and the means now available for effecting them the *Railway Age* begins this week the publication of a series of articles upon this general subject which will appear throughout the remaining part of the year 1931. Although many manufacturers are advertisers in this paper, we will make no apology for exploiting in our editorial columns, without specific mention of any manufacturer or his product, the money-saving equipment and devices the manufacturers have for sale. The railroads need the means of effecting economies that the manufacturers have to sell as much as the manufacturers need to sell them, and in endeavoring to enlarge the railway market for things that the railways need to buy we will be doing only what a railway paper should to promote the welfare of the railroad industry. All past railway progress has been accomplished by collaboration between the railroads and the manufacturers, and future progress will depend upon even closer and more intensive collaboration by them.

No improvement in railway physical properties can be made without the investment of new capital. The amount of new capital that can be raised and invested will depend upon the amount of net operating income earned. That will be determined largely by the regulating policy of the Interstate Commerce Commission. Therefore, the commission must be made to realize that it will largely determine how economically the railways can and will be operated in future.

Railway officers of all ranks and classes must study more broadly and thoroughly all the ways and means of effecting economies that are available now and will become available in the future. The railway equipment and supply manufacturing industry must in its own interest, play a more important part than ever in promoting the economy of railway operation. Some branches of that industry must show much more initiative and aggressiveness in improving the things they make if they are successfully to play their part in the new railroad era. Almost all parts of the supply industry need to show more resourcefulness and enterprise in selling to the railways. The railroad field is no place for "high powered" salesmanship. Railway officers are too busy to listen to salesmen who use the methods of book agents and vendors of blue sky securities. Success in selling to the railroads in future will depend more than ever upon the development of equipment and devices that will save operating expenses, and upon patient, persistent and intelligent education of railway officers regarding their merits.

Many manufacturers are acting now as if they believe that selling to the railways should be postponed until general business improves. Many of them are doing nothing to help those who are carrying on the fight to restore railroad earning capacity. The lack of fighting spirit and enterprise they are showing in these ways probably indicates that they are showing equally little foresight and enterprise in improving the things that they hope to sell after the earning capacity of the railways has been restored without their help. Fortunately for the railways, and also for themselves, many manufacturers have declined to hide in the cellar until the battle is past, but are helping in the fight to save the industry which affords them a market, and also are taking advantage of present conditions to improve old equipment and devices, to put new equipment and devices upon the market, and to inform railway officers regarding these things and their merits, confident that they will reap rewards later for what they are doing now.

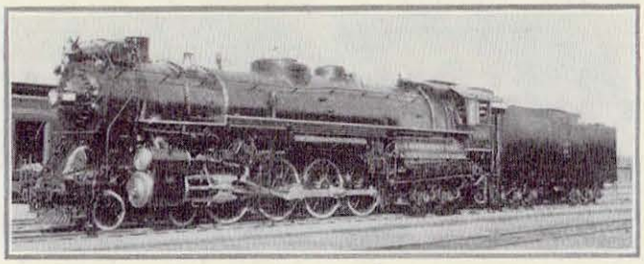
A Future of Great Opportunities

The *Railway Age* has not indulged during the last year or more in any of the unfounded optimism which has been so prevalent. We have presented the cold facts regarding both conditions and tendencies in the railway field and contributed all we could toward improving them. It is time, however, that all railway officers and all manufacturers dependent upon the railways for a market should recognize the fact that the railroads are not going out of business. Probably there will be as many miles of line when the depression ends as there were when it began. There will be great opportunities for railway officers to effect improvements in service and economies in operation, and the time to be preparing for them is now. There will be great opportunities for manufacturers to sell equipment and machinery for improving railway service and effecting economies, and the time to be convincing railway officers that they should buy these things is now, because never were railway officers so much interested in means of effecting not only temporary but permanent economies.

Those who "sell" them information and ideas now will get the orders for improved equipment and devices later on. Manufacturers who are now in hiding will then be wondering why they cannot compete successfully with those who spent their brains, energy and money during the period of adversity in trying to hold and enlarge their market in preparation for the return of prosperity.

The Way to Operating Economies

Operating Economy Series



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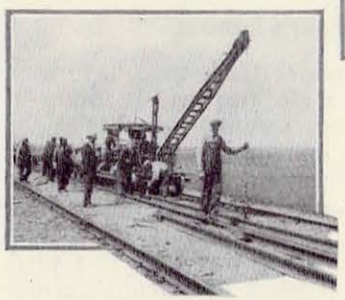
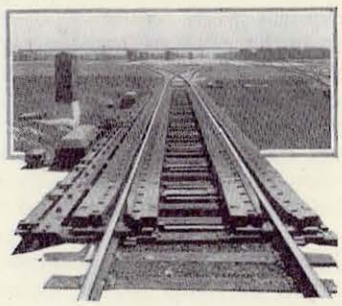




Railways must look to lower costs more than to increased business for the solution of their problems — Announcing a series of articles designed to show what is being done and can be done

THE managements of the American railways are now being put to a test which transcends anything that has ever before confronted them. For 90 years they shared with private business the advantage that accrues to any enterprise in rapidly developing territories, namely, a continuing growth in the volume of business done. In the case of the railways, a rapidly growing volume of traffic not only meant large increases in gross revenues, but resulted also in marked economies in the conduct of transportation and not infrequently in spite of inefficient or improvident methods. Potential increases in business justified the practice in vogue until very recently of basing the economy of a contemplated improvement not on the volume of traffic then prevailing, but on the anticipated traffic 10 or 15 years hence.

This situation no longer prevails. For while the decline in railway traffic due to the current world-wide depression is clearly the manifestation of a business cycle, and will be followed by an increase in rail traffic as general business improves, there is much to support the belief that the days of large growth in rail transportation are over. The volume of passenger traffic may be expected to suffer further decline and the trend line of freight movement as observed over a period of years has shown a sharp decline in the rate of increase in comparison with the records of past years.

Lower Costs of Operation

Therefore, regardless of the emergency measures that must be applied to effect a full recovery from the ills that now afflict them, the railways are confronted with an entirely new economic status that will not be greatly altered by an improvement in general business conditions. True, they can anticipate a restoration of traffic to volumes comparable with those which they moved in the later years of the last decade, but salvation must be sought in fields far more promising than potential increases in transportation demand. Whether, therefore, the railway problem is considered from the standpoint of the cold realities of the present or from the aspect of a restored national prosperity, the solution lies largely in more economical operation in the handling of the traffic that is offered.

The chapter in railway history embracing the period from 1920 to 1929 was one of outstanding achievement in decreased costs per ton-mile of transportation handled, whereas the past two years have been characterized by desperate efforts to effect reductions in operating expenses commensurate with the decline in earnings. Much has been accomplished by curtailments of service. Reduced traffic has made it possible to defer the maintenance of locomotives and cars not needed to meet present transportation requirements. A high standard of maintenance of the tracks and structures over an extended period has permitted the temporary deferment of renewals without sacrifice of safety.

Of Thoroughly Demonstrated Merit

But there is a limit to the possibilities of such measures. By their very nature they point to the eventual spending of a dollar, or perhaps a dollar and a half, for every dollar that is saved now, and with each day that such practices are followed the fact that they cannot be continued indefinitely becomes increasingly evident. Railway managements are, therefore, keenly alive to the fact that further reductions in operating expenses must mean real savings rather than a mere postponement of disbursements. The need of the present serves but to focus attention on the fundamental requirements for the continued success of the railways, whether viewed as a business conducted for profit or as an essential utility for national commerce.

The answer does not lie in the launching of any harebrained or radical schemes, but in the application on a larger scale of measures that have already demonstrated their worth by practical application on, not one, but many of the railways. For example, further progress in reducing the annual consumption of cross-ties will be brought about not so much from refinements in practice that will result in even greater average life than that now being realized by some of the railroads, as from the attainment by all of the roads of the results now being obtained by those whose practices are conceded to be the most beneficial.

It is conceded, of course, that, like all business, the conduct of railway transportation is susceptible to better management and supervision resulting in improve-

ment of methods, but it is difficult, if not impossible, to single out any one measure for the attainment of important economies in operation that has not entailed or will not entail some substantial initial expenditure for improved equipment, better materials, betterments or additions to the fixed property, or power-operated machinery.

Thorough going supervision will insure that trains are made up to full tonnage rating, but no marked decrease in the cost of moving a given volume of traffic can be effected without an increase in train loads that involves much more than improvement in methods. It requires grade reductions or more powerful locomotives or both; cars of greater capacity; and longer trains cannot be handled efficiently without better brake equipment, stronger draft rigging, and longer yard and passing tracks. It is now generally conceded that a real test of efficiency in transportation must take into account the element of time as measured by such units as ton-miles per train-hour and ton miles per car-day, and to effect improvements in performance as tested by these units calls for locomotives embodying a combination of many of the elements formerly confined to the freight locomotives on the one hand and the passenger locomotives on the other. In addition, it demands better signaling equipment to insure that trains are not delayed unnecessarily on the road, larger tender cisterns and coal spaces and adequate classification yards.

Other Opportunities for Economy

There are also many fields for economies in operation that have no direct bearing on the relation of ton-miles to train-hours, namely, means for reducing the man-hours and quantities of materials, fuel and supplies required for the movement of traffic and the maintenance of the property. And here again the answer is to be found almost entirely in the acquisition of new or improved facilities and equipment. In the maintenance of tracks alone, at least a dozen entirely new power devices, and an equal number of adaptations of equipment previously employed for other purposes, are now available for the performance of operations that were carried on almost entirely by hand only a few years ago. In the operation of trains, centralized control has demonstrated its ability not only to expedite train movement, but to effect marked economies in man power, while in terminal operation the car retarder speeds up the classification of trains while greatly curtailing the yard forces.

Brief reference has already been made to the influence of the modern locomotive on economy in train operation, but advance in locomotive design and construction has been by no means confined to the attainment of greater power and speed. While progress in locomotive design, characterized by such elements as greater size and power, the automatic stoker and the superheater, has extended over a large portion of the present century, improvement has continued apace, and the locomotive of today is a far more efficient machine than its counterpart of only five or six years ago. The introduction of the four-wheel trailer permits of larger grate areas and a better distribution of wheel loads on the track, high strength steels allow higher boiler pressure without a proportionate increase in weight, etc. With these improvements and the feed-water heater, the booster, the cast-steel engine bed and integrally cast cylinders, and other refinements in design and construction, the locomotive of today is not only possessed of greater power and capable of greater speeds under full loads, but operates with greater fuel economy and for longer mileages between shoppings.

Really modern locomotives of the greatest efficiency are only a small part of those now in service, and the economies that can be effected by replacing all obsolete locomotives with the more modern and efficient types are very large. No better evidence of the superior performance of the modern locomotive is to be had than that afforded by the results obtained during the present curtailment of traffic by those railroads which have been in a position to handle practically all trains with power of recent purchase.

The Manufacturer's Influence

While locomotives and power track tools have little in common, mention of these two widely different classes of railway appliances serves to emphasize the scope of the manufacturer's influence on the efficiency and economy of railway transportation; in fact, it is almost impossible to mention any phase of railroad operation, whether it concerns the delivery of coal to locomotives or the dispatching of way bills at a yard, that has not felt the potent touch of inventive genius and business enterprise brought to bear by some branch of the railway equipment and supply manufacturing industry.

In some instances, as in the case of the car retarder, the basic idea was conceived in the mind of a railway officer, but, on the whole, modern railway appliances, like nearly all industrial advance of the present day, are the product of research and development work in the drafting room laboratory and test rack of the manufacturer. And even a device evolved by an officer of a railway is subjected to extensive and costly development by the supply company before its economic potentialities can be effectually realized.

This is not said in depreciation of the part played by the railways in their development, for without painstaking service tests and constructive criticism on the part of railway officers, few mechanical appliances now in use would have attained the success they now enjoy. Moreover, many railway officers have virtually staked their reputations in recommending the purchase of expensive equipment of great potential but unproved merit. The manufacturers, however, have not only staked reputations but, in many cases, also large sums of money in the experimental work necessary for the perfection of appliances and in subsequent promotional effort before a dollar of profit was realized.

A Real Incentive

That such enthusiasm has been justified is evidenced by the outstanding progress that has been made in the application of power appliances and in the replacement of obsolete equipment with new units of greater efficiency. Supply manufacturers have had the courage to continue their development work because they have known that the railway managements gladly entertain suggestions that promise operating economies, and are ready to make expenditures for improvements if they promise an adequate return on the investment.

The *Railway Age* has long assumed as one of its primary duties that of apprising its readers not only of the current developments in appliances designed to improve railway service and effect economies in operation, but also of recording the progress made in their application and the results that have accrued from effective utilization. This record, spread over the pages of *Railway Age*, from year to year, although constituting a current history of railway progress, is neces-

sarily of a piecemeal character. It does not, for this reason, afford a perspective that permits of a ready conception, in its entirety, of the present status of this advance in the mechanization of railway operations.

A Series of Articles

Believing that there is a real need for a concise review of the opportunities now offered for the attainment of further economies in railway transportation, *Railway Age* has undertaken the preparation of a series of articles that will set forth from week to week, in accordance with a topical classification, what the advance in the development of railway equipment, materials and supplies is now contributing and can more largely contribute in the future to this end.

Thus, the first installment, to appear in next week's issue, will show how the cost of providing locomotive water supplies can be reduced by installing modern equipment, capable of pumping water at a lower cost per gallon and subject to automatic or remote control that reduces the charge for attendance; and by providing larger supplies with adequate storage which, together with larger tender cisterns, reduces the number of train stops to take water. It will also review modern trends in water treatment and show how improved water supplies reduce operating costs and boiler and fire-box repairs.

In Next Week's Issue

A modern locomotive is an expensive machine, but the economies it is designed to produce will not be secured if it is tied up frequently for boiler repairs and flue renewals. Good water is an essential for economical operation. Adequate supplies available at properly spaced locations reduce the number of train stops for water, and efficient pumping plants equipped for automatic or remote control can be operated at smaller expense for fuel, attendance and maintenance. The next article in this series will show how better water supply facilities reduce operating expenses.

The second article will show how the substitution of the motor coach for the passenger train under favorable conditions will reduce train service expenditures. The third article will show how the application of car retarders to classification yards will effect improvements in operation and savings in cost. Other installments of the series will be concerned with the locomotive and other rolling equipment. Still others will show how the power tie-tamper, for example, effects reductions in the cost of track surfacing; how modern methods for the conservation and restoration of rail ends will result in an increase in rail life; how snow melters effect enormous reductions in the wages paid to casual labor hired to meet emergencies, reduce the man-hour exposure to the hazards of one of the most dangerous forms of employment, and result in savings by reason of the train delays and traffic tie-ups which they prevent.

A Complete Survey

While it is not possible in all cases to express in dollars and cents the operating economies to be effected by the use of power work equipment or modern facilities of the various types, this can be done with respect to a large number of installations. But aside from the specific information presented in individual installments of this series, it is hoped that the series as a whole will comprise a comprehensive survey of the entire field, cataloging, as it were, all of the primary agencies for the furthering of operating economies through improvements in the various elemental details of the railway plant.

Thus, these articles will show in an orderly manner what agencies are available for the attainment of greater efficiency in the various phases of railway operation, how they are being used and something with respect to the actual returns that are to be gained through their use. It is hoped that this series of articles will be of real value to the readers of the *Railway Age*.

Rail-Truck Service of Two Electric Lines*

By A. H. Gossard†

MOTOR trucks are being more generally used by railroads. The Chicago, North Shore & Milwaukee, an electric railroad operating between Chicago and Milwaukee, Wis., a distance of 85 miles, uses a fleet of motor trucks with trailers, and has established what is known as "Ferry Truck Service." Trailers are delivered to the door of the shipper, who loads the trailers and seals them. The dispatcher is then notified, and he sends a tractor to pick up the trailer, and set it on a specially constructed flat car capable of holding three trailers. The tractor is withdrawn after loading the trailer. On arrival at destination, a tractor is coupled to the trailer, and it is then taken directly to the door of the consignee, who breaks the seal and unloads the trailer.

This shipping service corresponds to the trap-car service of railroads, and it results in a great saving in operating cost to the railroad by reason of the fact that the shipment is not transferred into freight cars, and two handling operations are eliminated, that of loading and unloading the shipment. In addition, the possibility of pilferage and loss is reduced to a minimum, and since the trailers are of all-steel-construction and watertight, the possibility of damage by weather conditions is negligible.

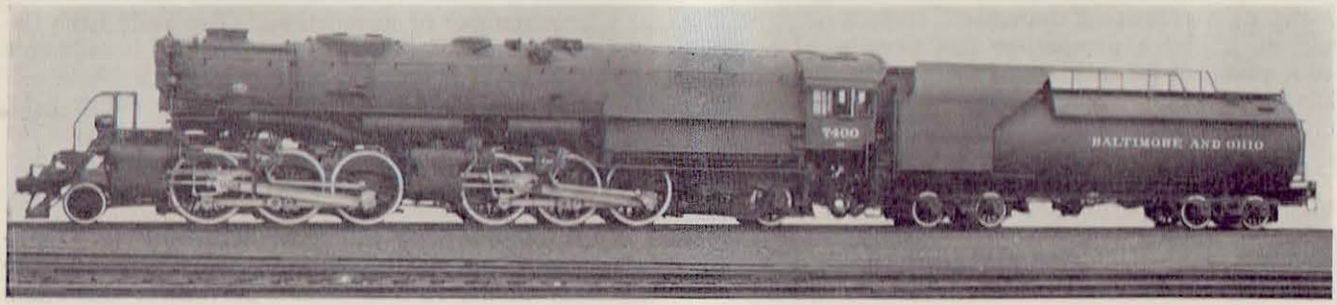
The advantages to the shipper and consignee are that all cartage charges are eliminated and four handling operations are made unnecessary, that of loading and unloading the truck at both the origin and the destination points. Moreover, it is not necessary to mark each carton or individual piece. The shipper knows that whatever he loads into the trailer will be delivered intact to the consignee.

In addition to this "ferry service," the North Shore electric railroad has 18 off-track freight stations in Chicago where package freight is received or delivered to shippers. The same trailers that are used in the "ferry service" are loaded with package freight at these various stations. When the trailers are loaded, the dispatcher is notified and a tractor then delivers the trailer to the rail head where the package freight is sorted and loaded into a package rail car.

(*Continued on page 59*)

* From a paper presented at the summer meeting of the Society of Automotive Engineers at White Sulphur Springs, W. Va., June 14-19.

† Mr. Gossard is associated with the Middle West Utilities Company.



Class KK-1 Locomotive Equipped With Emerson Water-Tube Firebox Built by The Baldwin Locomotive Works

Test Locomotives of 4-8-2 and 2-6-6-2 Types on the B. & O.

One of each type equipped with Emerson water-tube firebox—Tests show economy in consumption of fuel and water

THE Baldwin Locomotive Works delivered four test locomotives to the Baltimore & Ohio in December, 1930, and January, 1931, for operation over certain heavy-tonnage districts on the system. Two of these locomotives are of the 4-8-2 type, one of which is equipped with an Emerson water-tube firebox (road class T-1) and the other is of conventional design (road class T-2). Both locomotives, as shown in one of the tables, have essentially the same weights and dimensions. The other two locomotives are also built to the same essential specifications but are single-expansion articulated 2-6-6-2 type locomotives. One has an Emerson water-tube firebox (road class KK-1) while the other (KK-2) is of conventional design.

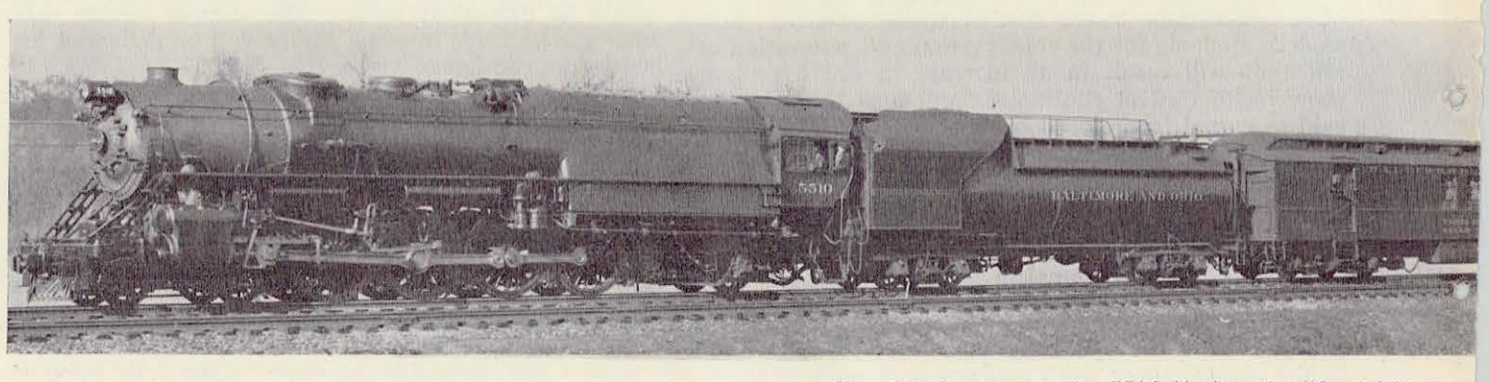
Locomotive classes T-1 and T-2 develop a tractive force of 65,000 lb. They have 74-in. driving wheels and 27½-in. by 30-in. cylinders. The boilers operate at a pressure of 250 lb.

Locomotives class KK-1 and KK-2 have a rated maximum tractive force of 90,000 lb. and operate at a boiler pressure of 250 lb. They have 70-in. diameter driving wheels and 23-in. by 30-in. cylinders.

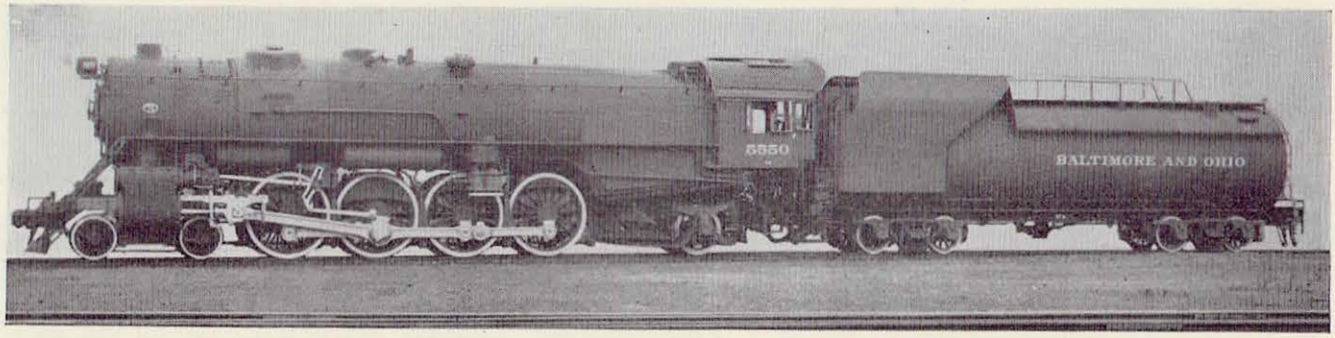
The Baltimore & Ohio has several heavy-tonnage districts which are served with either heavy 2-8-0 type locomotives or light 2-8-2 type locomotives on account of a number of bridge limitations, especially west of Grafton, W. Va. The 2-8-0 type locomotives have a tractive force of 50,900 lb. and 2-8-2 types from 51,000 lb. to 56,000 lb. The class Q-1aa of the better type generally used in that district, with 223,600 lb. on the drivers, are the heaviest locomotives permitted with the driving wheels spaced from 5 ft. 5 in. to 5 ft. 10 in.

To move the tonnage in these districts it is frequently necessary to double-head the 2-8-0 and 2-8-2 type locomotives, with resultant high cost of operation. In addition, it is not possible to operate these locomotives over extended runs or at speeds necessary to meet the traffic demands.

Considering the above points and also the fact that the cost to strengthen or rebuild all the structures to suit heavier and more powerful locomotives such as the heavy 2-8-2 and 2-10-2 types, road class S-1, would be prohibitive and require a number of years, it was decided that it would be more economical to design new power. This resulted in the purchase of the class KK-1 and KK-2 locomotives.



Class T-1 Locomotive No. 5510 Hauling the "Capitol Limited"

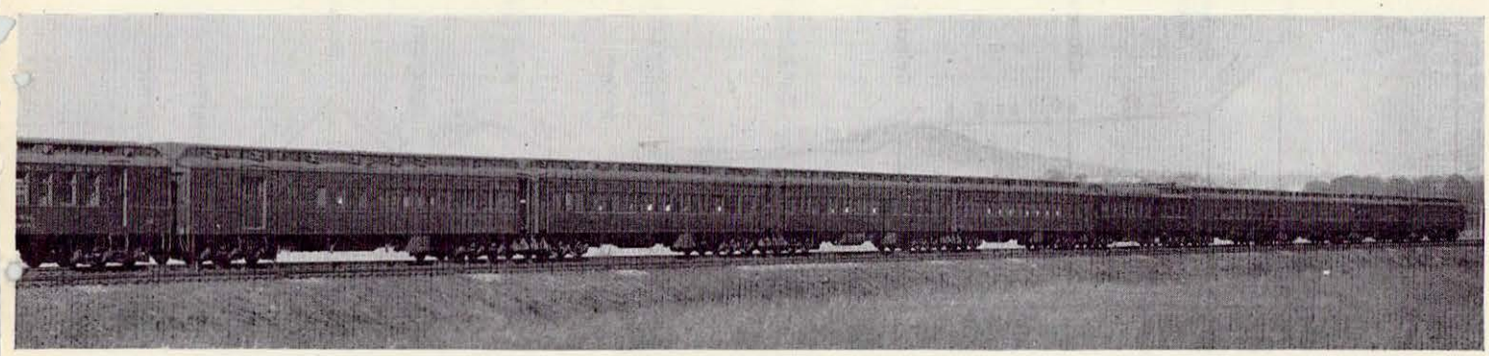


Class T-2 Locomotive Built for the Baltimore & Ohio by Baldwin

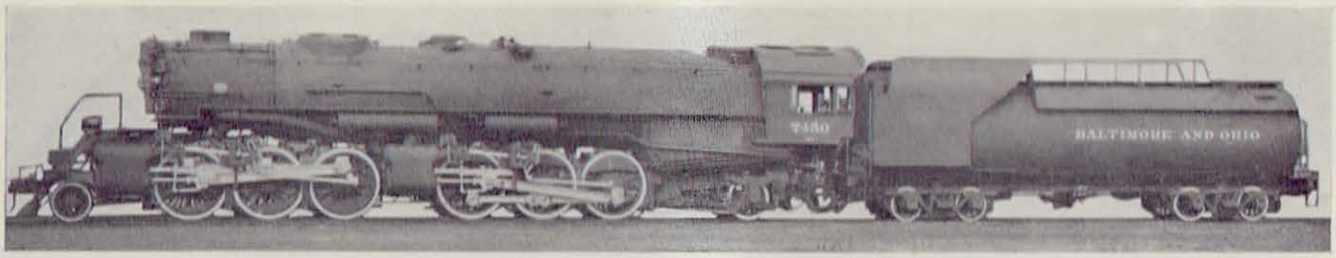
In the development of the design of the two articulated locomotives a careful study and comparison was made of the design and performance of various types of locomotives in service on the Baltimore & Ohio. The principal weights and dimensions of the types included in the study are shown in the table. This showed that a high-wheel light 2-6-6-2 single-expansion articulated locomotive with a tractive force of 90,000 lb. would meet requirements. In addition, it was estimated that a locomotive of this design could be more economically used in the territories over main-line tracks where the heavy 2-8-2 and 2-10-2 types are

Comparison of Existing Baltimore & Ohio Locomotives With the New 4-8-2 and 2-6-6-2 Types Built by The Baldwin Locomotive Works

Railroad	B. & O.	B. & O.	B. & O.	B. & O.	B. & O.	B. & O.	B. & O.	B. & O.	B. & O.	B. & O.
Builder	B. & O.	Baldwin	B. & O.	Baldwin	Baldwin	American	Baldwin	Baldwin	Baldwin	Baldwin
Year built	1924-26	1920-21	1925	1930	1930	1910	1911	1923	1930	1930
Service	Passenger	Passenger	Passenger	Passenger	Passenger	Freight	Freight	Freight	Freight	Freight
Road class	P-1d	Q-4	T	T-1	T-2	E-27ca	Q-1aa	S-1	KK-1	KK-2
Type of locomotive	4-6-2	2-8-2	4-8-2	4-8-2	4-8-2	2-8-0	2-8-2	2-10-2	2-6-6-2	2-6-6-2
Max. tractive force, lb.	51,000	63,200	68,200	65,000	65,000	50,900	54,600	84,300	90,000	90,000
Wt. on drivers ÷ tractive	3.92	3.9	4.03	4	4	3.94	4.1	4.12	4.13	4.14
Cylinders, diam. and stroke, in.	26½x28	26x32	30x30	27½x30	27½x30	24x30	26x32	30x32	4-23x30	4-23x30
Valve gear, type	Baker	Baker	Baker	Walsch.	Walsch.	Baker	Walsch.	Baker	Walsch.	Walsch.
Weights in working order:										
On drivers, lb.	200,000	247,000	275,000	260,000	260,000	202,900	223,600	347,230	372,000	373,000
On front truck, lb.	55,000	22,700	62,000	61,000	62,000	22,000	18,400	31,570	30,000	30,000
On trailing truck lb.	62,000	57,700	63,000	63,000	63,000	.....	40,200	57,710	63,000	63,000
Total engine, lb.	317,000	327,400	400,000	384,000	385,000	224,900	282,200	436,510	465,000	466,000
Tender, lb.	232,000	214,000	269,000	273,000	273,000	148,070	181,500	298,400	273,000	273,000
Total engine and tender, lb.	549,000	541,400	669,000	657,000	658,000	372,970	463,700	734,910	738,000	739,000
Wheel bases:										
Driving, ft. in.	13-0	16-9	19-3	19-3	19-3	16-8	16-9	22-4	34-11	34-11
Total engine, ft. in.	34-8	35-1	41-4	44-7	44-7	25-7	35-0	42-11	56-0	56-0
Total engine and tender, ft. in.	76-5 7/8	74-1½	90-7 1/16	92-11¾	92-11¾	59-8½	71-2 5/16	89-10 7/8	104-4¾	104-4¾
Driving wheels, diam. outside tires, in.	74	64	74	74	74	62	64	64	70	70
Boiler:										
Style	St. top	St. top	St. top	W.T.Firebox	St. top	St. top	St. top	St. top	W.T.Firebox	St. top
Steam pressure, lb.	225	220	220	250	250	215	190	220	250	250
Fuel, kind	Bit.	Bit.	Bit.	Bit.	Bit.	Bit.	Bit.	Bit.	Bit.	Bit.
Diameter, first ring, inside, in.	78	78	90	89 5/8	89 5/8	74½	78	90	89 5/8	89 5/8
Firebox, length and width, in.	120x84	120x84	132¼x96	138x96	138¼x96¼	107 5/8x75¼	120x84	132⅛x96	138x96	138x96¼
Length over tube sheets, ft. in.	21-0	20-5	23-0	20-0	21-0	15-10	21-10	23-0	25-0	25-0
Grate area, sq. ft.	70	70	89.17	92	92.3	56.24	70	88	92	92.3
Heating surfaces:										
Firebox and comb. chamber, sq ft.	228	228	341	783	361	179.3	228	347	783	383
Arch tubes, sq. ft.	28	35	42	83	18	.....	.....	42	83	18
Thermic syphons, sq. ft.	.....	.....	.....	.....	95	.....	.....	.....	.....	95
Tubes and flues, sq. ft.	3,706	3,550	5,208	4,537	5,015	2,213.4	3,708	4,881	5,677	5,975
Total evaporative, sq. ft.	3,962	3,813	5,591	5,403	5,489	2,392.7	3,936	5,270	6,543	6,471
Superheating, sq. ft.	859	955	1,305	1,340	2,451	425	811	1,510	1,666	2,900
Comb. superheating and evap., sq. ft.	4,821	4,768	6,896	6,743	7,940	2,817.7	4,747	6,780	8,209	9,371
Tender:										
Water capacity, gal.	13,500	18,000	18,000	18,000	18,000	7,000	9,500	15,800	18,000	18,000
Fuel capacity, tons	19	17½	20	20	20	18	18½	23	20	20



—Photograph Taken Two Miles East of Point of Rocks



Class KK-2 Locomotive—Constructed With Stayed Firebox

used, because of the increased capacity and speed of the articulated power. The KK class locomotives can be operated anywhere on the Baltimore & Ohio lines between New York and Chicago, and East St. Louis, Ill. This includes the Reading and the New Jersey Central lines over which the Baltimore & Ohio operates to New York.

Advantages of the 4-8-2 Types

There is also some territory on the Baltimore & Ohio, especially between Washington, D. C., and New Castle Junction, Pa., that is now served with heavy stoker-fired 4-6-2 type passenger locomotives. However, with trains of over eight cars it is necessary to use helper service over mountain grades. To handle important twelve-car passenger trains over the grades without a helper and also to meet weight and clearance limitations as well as operating schedules the T-1 and T-2 class 4-8-2 type locomotives were designed. These locomotives have sufficient flexibility to meet the requirements described and to be used on the main line between New York and Chicago, and Grafton, W. Va. They are also suitable for handling fast-freight trains which are now handled by 2-8-2 type locomotives of the Q-4 class having 64-in. drivers.

The T-1 and T-2 class locomotives were designed to meet weight limitations of around 658,000 lb. With this limit, tenders with a capacity of 18,000 gal. of water and 20 tons of coal were found to be practicable. Comparison of these two classes of 4-8-2 type locomotives with the classes P-1d, Q-4 and T are also shown in the table.

With the exception of the firebox and some of the boiler details, the classes T-1 and T-2 and the classes KK-1 and KK-2, respectively, are identical. The two locomotives equipped with the Emerson water-tube firebox have Type A superheaters, while the two with the fireboxes of customary staybolt construction have two Thermic syphons and Type E superheaters. Other specialties applied to all four locomotives include Elesco exhaust-steam injectors, Lower stokers, Barco Power reverse gears, General Steel Castings Company cast-steel cylinders, and General Railway Signal train-control equipment.

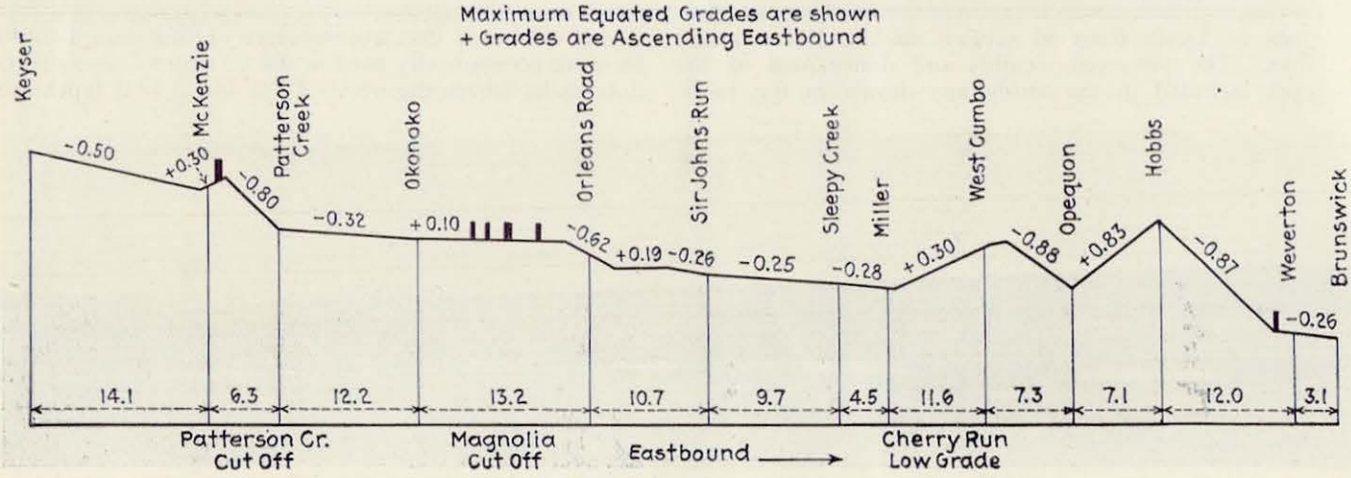
Average Results of Dynamometer Road Tests Between Keyser, W. Va., and Brunswick, Md., with Locomotive No. 7400

Number of test runs	3
Season of year	Winter
Train consist:	
Number loads	96
Number other cars	1
Total number cars	97
Actual tonnage	8,245
Total time en route	5 hr. 49.6 min.
Road delays	36.4 min.
Net running time	5 hr. 13.2 min.
Average speed, m.p.h.	20.91
Number stops	3
Total coal as fired, lb.	31,500
Total water evaporated, gal.	27,204
Coal as fired per 1,000 gross ton-miles, lb.	35.14
Coal as fired per sq. ft. grate area per hr., lb.	86.82
Evaporation, water per lb. coal as fired, lb.	7.20
Coal per drawbar hp.-hr. as fired, lb.	3.14
Water per drawbar hp.-hr., actual, lb.	22.59
Average drawbar hp.	2,546
Average drawbar pull, lb.	47,951
Average boiler pressure, lb. per sq. in.	246.2
Average steam chest pressure, lb. per sq. in.	216.3
Average back pressure, lb. per sq. in.	3.7
Average cut-off, per cent	42.8
Maximum steam temperature, deg. F.	610
Average B.t.u. per lb. coal as fired	12,994
Per cent moisture in coal as fired	1.74
Overall thermal efficiency at drawbar, per cent	6.25
Pusher used between Opequon and Hobbs	

The Emerson Water-Tube Firebox

The Emerson water-tube fireboxes on the classes T-1 and KK-1 are designed with a single drum. While different in some details from other designs of water-tube fireboxes which have been applied to other Baltimore & Ohio locomotives, they are designed on the same basic principles.

The drum is 40 in. outside diameter and extends the entire length of the firebox with an extension into the shell of the boiler. It is secured to the back tube sheet at the front, and to the backhead and door sheet at the



Profile of Line Over Which Tests With the Class KK-1 Were Made

rear. The back tube sheet is flanged toward the inside to form the riveted connection to the drum, instead of toward the fire side of the sheet. This construction eliminates the double thickness of metal exposed to the radiant heat of the fire, thereby preventing fire cracks.

The front and back water spaces are connected on each side at the bottom with a 5½-in. by 7½-in. seamless rectangular header. Headers of the same size are used at the top which extend along both sides of the drum. The ends of the top headers are blank and have no direct connection with either the back water space or the shell of the boiler.

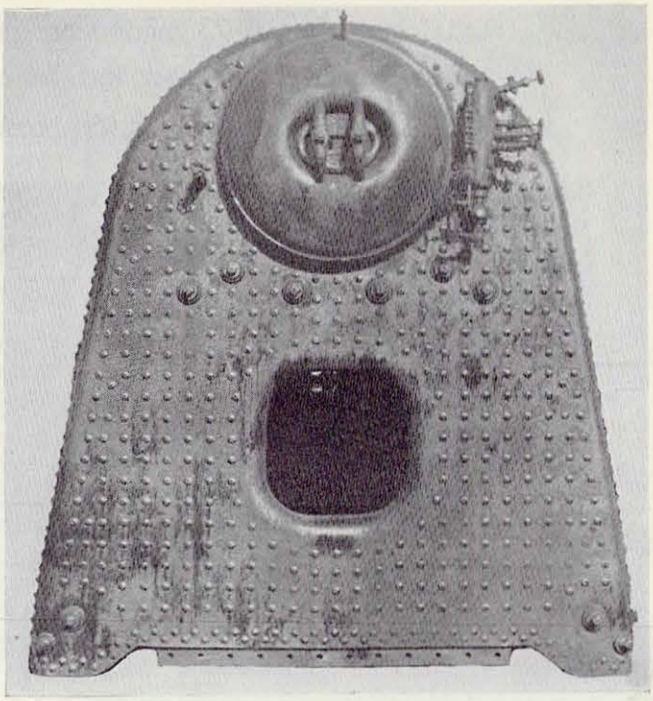
A total of 190 water tubes, 2½ in. outside diameter, are arranged in two rows between the top and bottom headers. Coarse-thread plugs are located in the top of the top headers opposite the ends of the tubes, convenient for rolling in and also for turbining the tubes at washout periods. Construction plugs are used in the bottom of the bottom headers for convenience in rolling in the tubes. These plugs are not removed when the tubes are turbined. The top headers are connected to the drum along each side with a series of 13 short nipples 4-in. in outside diameter. A shallow pressed-steel hip sheet joins the top portion of the drum to the boiler shell. An approved form of insulation is applied between the drum and the upper side headers and over the water tubes at the sides.

The installing of a water-tube firebox in locomotives class T-1 and KK-1 effected a substantial increase in heating surface over the stayed firebox without increasing the weight. For example, the water-tube firebox has an evaporative heating surface of 866 sq. ft. as compared with 474 sq. ft. of evaporative surface for the stayed fireboxes, including the syphons, an increase of 82 per cent. To increase the heating surfaces of the stayed fireboxes to obtain the same heating surface as the water-tube fireboxes, the additional weight would have required a four-wheel trailing truck, and furthermore would have increased the total weight of the locomotive to such an extent as to prohibit operation over a large number of divisions. The water-tube fireboxes have a large combustion chamber, part of which can be conveniently used for increasing the grate area if desired.

Road Tests of the Class KK-1

A series of road tests with a dynamometer car were made with the 2-6-6-2 type locomotive, No. 7400, which is equipped with the Emerson water-tube firebox. These tests were made in slow-freight service eastbound on the east end of the Cumberland division, between Keyser, W. Va., and Brunswick, Md. This is not the operating territory for which the locomotive was designed, but is the division regularly used by the railroad for road tests. The profile of this part of the line, shown on one of the drawings, is especially adapted for road tests. Owing to the fact that other locomotives have been tested over this same line, a comparison with other performances can be readily made.

The distance from Keyser to Brunswick is approximately 112 miles. Between Opequon and Hobbs, a distance of seven miles, there is a ruling grade of .83 per cent with a maximum curvature of 4 deg. Helper service is required between these two points.



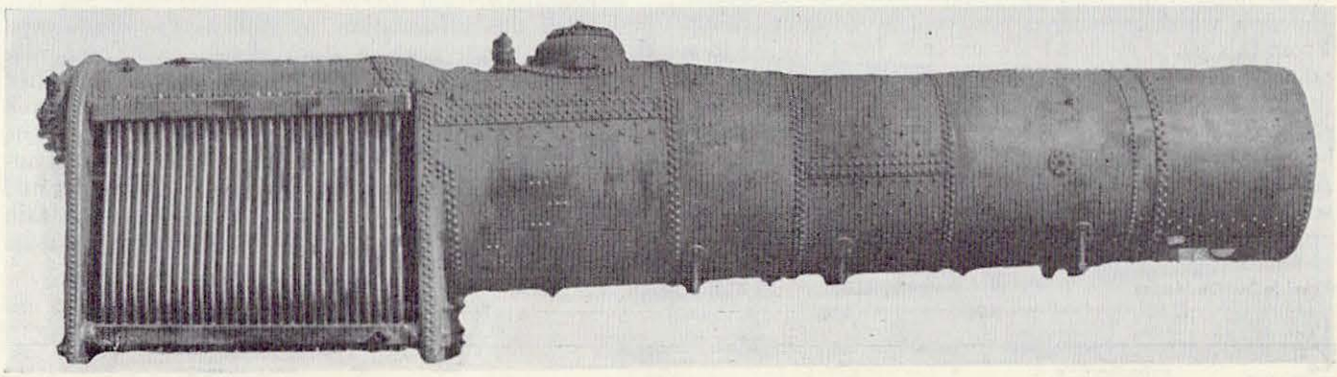
Back Head of the Emerson Water-Tube Firebox

The tonnage hauled during the tests averaged 9,700 adjusted tons. The trains were made up of loaded 50- and 70-ton coal cars. The average results of these tests are shown in one of the tables. Several preliminary runs were made to determine the correct size of nozzles which would properly draft the engine for this service. Two 5½-in. open exhaust nozzles gave the best results.

Results of the Road Tests

A study of the figures given in the table show that exceptional economy was obtained, both in coal and water consumption. The coal and water consumption per drawbar horsepower per hour affords an accurate

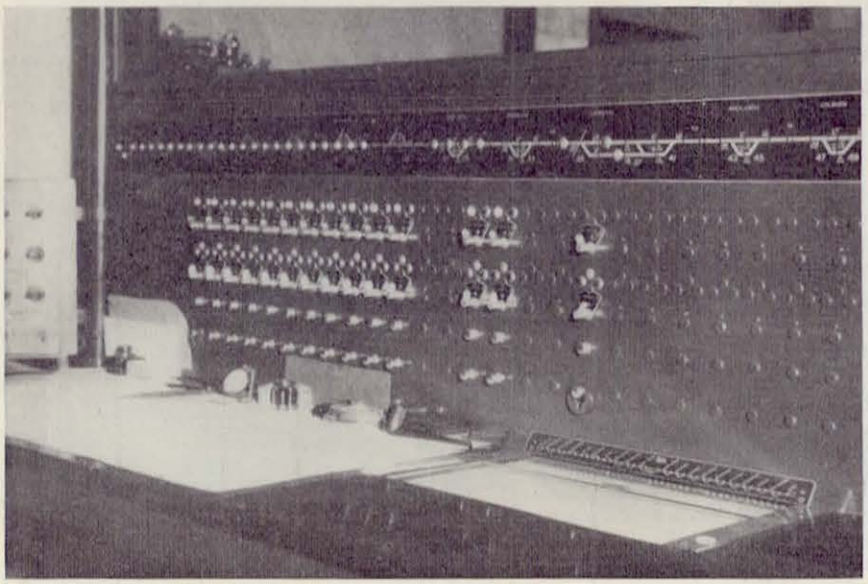
(*Continued on page 55*)



Side View of Boiler Equipped With Emerson Water-Tube Firebox—This Boiler is Applied on a 4-6-2 Type Locomotive Class P9A

Centralized Traffic Control on the Wabash

Dispatcher located 93 miles from far end of 37-mile single-track installation— Operating savings justify cost



The Control Machine at Peru

The Switch at State Line
93 Miles from Peru

SEVERAL features of special interest are included in the installation of centralized traffic control on 37 miles of single-track line of the Wabash between LaFayette Junction, Ind., and State Line. The control machine in the dispatcher's office at Peru, Ind., is the largest yet built of this type, being 8.5 ft. long and containing not only the levers for the State Line-LaFayette section but also spare spaces for additional levers to control the remainder of the division between Danville, Ill., and Peru, Ind.

The Track Layout and Traffic

Starting at Danville, double track extends 7.4 miles to State Line, from which point the line is single track for 37 miles to the Big Four grade crossing at LaFayette Junction, which crossing is protected by an interlocking. From this plant, second track extends for 1.8 miles to a point just west of the LaFayette station beyond which the line is single track for 52.9 miles to Peru. A grade ranging from 0.3 to 1.1 per cent and adverse to westbound trains extends for about six miles just west of Attica. On the remainder of the State Line-LaFayette section the grade is rolling with short stretches ranging up to 0.8 per cent. Near Attica there is one 5-deg. curve requiring a speed limit of 25 m.p.h. but at no other point on this line is the curvature sharp enough to interfere with the normal operation of trains.

In 1928 and 1929, as many as 10 to 14 freight trains, in addition to the 4 passenger trains, were handled each way daily, which made a total of from 28 to 36 through-train movements per day. Under these conditions, consideration was given to the construction of a second track over certain extensive sections of the division. However, a study showed that a complete installation of centralized traffic control would increase the track capacity so that the present traffic as well as the normal increase could be handled satisfactorily for several years.

Dispatchers' train sheets for five days were selected, and from this information, as well as the conductors' daily time slips, graphic train sheets were prepared, showing the movement of trains as they were dispatched by written orders. On these same charts, in colored pencil, were plotted lines to show the movement of the same trains as they would have been run by signal indication with the switches and signals power-operated and controlled by the dispatcher. In platting for train operation under the two methods of operation the same

Track and Signal Plan of the Territory

values were used for the running time between stations. The same time also was allowed for station work, taking water and coal, and for other unavoidable delays. Therefore, the time savings shown by the centralized control method represented only the avoidable time lost in opening and closing switches, starting and stopping at switches, and waiting for orders or meets—that is, where a train could have been advanced to the next station under conditions made possible by the centralized control method of operation. A study of the completed charts for the five days showed an average saving of 35 min. for each freight train and an increase in average train speed over the division of 1.8 m.p.h. or 11 per cent.

In order to determine the possible benefit which the increased average speed would effect in terms of added track capacity, a graphic train sheet was prepared to include the 8 passenger and 22 freight trains operated on a certain date as they could be moved under the centralized control system. To this chart were then added the lines for five additional eastbound and six additional westbound through freight trains. Even with this increase of 33 per cent in the number of trains, bringing the total to 41 trains, it was evident that additional capacity was still available to operate more trains without increasing the average elapsed time between terminals.

No consideration was given to the cost of extending passing tracks to handle longer trains, because the then-existing passing tracks were not long enough to hold trains with tonnage equal to that of the engine ratings. Therefore, this cost was rightfully chargeable against increased tonnage capacity, rather than a system to be employed to facilitiate operation.

Part of System Installed

On the basis of the studies that were made, it was decided to install the centralized traffic control system. However, about that time traffic was reduced decidedly so that when orders were placed for equipment in September, 1930, it was decided to install only the first section of the field equipment, that is, between State Line and LaFayette. This section was chosen because it permitted the greatest proportionate reduction in operating costs, as eight operators could be transferred to other points as soon as the system was completed.

The control machine is located in the dispatcher's office at Peru and is large enough to control the entire territory when the remainder of the district is equipped. Likewise, the three-code control line wires have adequate capacity. Therefore, additional power-switch layouts with attendent signals for governing train movements at such points can be added at an additional cost of only $7,000 per switch. In fact, in two cases where grade conditions made it desirable to have power switches in order to eliminate train stops at passing tracks, such apparatus was included in the original installations. These switches, at Delphi, Ind., and Clymers, are between LaFayette and Peru, outside of the centralized control territory now in service.

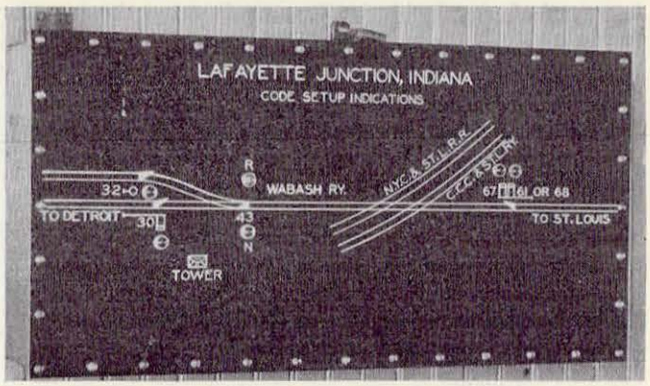
The passing tracks at Marshfield, West Lebanon, Williamsport, Attica, Riverside and West Point were each lengthened to hold trains of 125 cars. As a part of the 1931 track program, 110-lb. rails with new crushed rock ballast are to be laid throughout this territory, at which time No. 20 turnouts will replace the present No. 11 turnouts on all passing tracks where power switches are used.

The control system is the code type, all signaling equipment, power switches, control machine, etc. being furnished by the Union Switch & Signal Company and installed by Wabash signal department forces.

Special Signal Requirements

Three-position semaphore automatic block signals controlled on the overlap system had been in service in this territory since 1916. As a part of the new improvements, the control was changed over to the absolute permissive block system, which necessitated that many of the signals be relocated.

New searchlight-type color-light signals were installed at the ends of double track and at passing sidings where such signals direct the movement of trains entering a block or entering or leaving a siding. As will be noted from the track and signal plan, the head-block signal is located opposite the dwarf signal in line with the clearance point of the siding, thus protecting movements being made into or out of the switch. With No. 20 turnouts, these signals



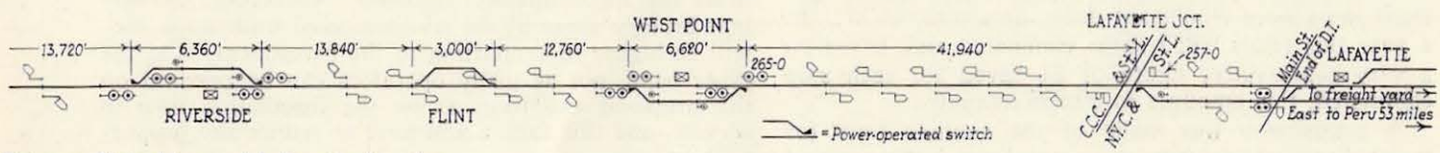
A Special Track Panel Is Used in the Tower at LaFayette Junction

are about 400 ft. from the switch point and series-type fouling circuits are, therefore used to insure proper fouling protection. All signals are located on masts to the right of the track governed, the track being realigned to allow adequate clearance where necessary.

The power-operated switches are equipped with dual-control switch machines the entire switch layout being constructed on new ties with adequate adjustable rail braces. All other main-line switches are protected with switch circuit controllers connected to afford signal protection the same as in any automatic block signal system.

Special Conditions at LaFayette

As LaFayette Junction is temporarily the eastern end of the centralized control territory, signal 257-0, which is also the westward home signal for the interlocking, controls train movements on to the single track and authorizes a train to move to signal 265-0 at West Point. The problem then arose as to how signal 257-0 could be controlled jointly by the dispatcher at Peru and the



Between State Line and LaFayette Junction

leverman at LaFayette Junction. To solve this, an illuminated track chart was mounted above the interlocking machine at LaFayette Junction. Small electric lamps are mounted in this board, one at the switch, another at signal 257-0, and a third at the dwarf signal used to direct reverse movements on the opposite main track. The indications on the dispatcher's machine show the position of this switch and the indications of these signals. If the dispatcher wants the switch moved, he operates the lever on his machine which lights a light on the diagram at LaFayette Junction and also releases an electric lock on the lever. If other conditions at the plant permit, the leverman can then throw the switch. The same procedure is necessary for moving a signal lever; in other words, the leverman actually moves the switch or clears the signal by means of the regular interlocking levers, but the dispatcher has control of the levers by means of electric locks and, in addition, the dispatcher knows at all times the position of the switch and the indications displayed by the signals.

Another special condition arose because LaFayette is a train order office at which all trains stop and register. As the centralized control system was to eliminate the use of train orders from LaFayette west to State Line, some consideration had to be given to the 1.8 miles of territory between LaFayette Junction and LaFayette. As double track extends from the junction to Main street, trains could be moved in this territory by automatic signal indication according to rules for double-track operation. However, some means of directing trains over the 500 ft. of single track between Main street (end of double track) and LaFayette block office had to be provided. This problem was solved by installing, at Main street, an eastbound two-indication color-light-type train-order signal for each track. These signals are controlled by enclosed knife-switches on the operator's desk at LaFayette. If he throws a lever up, the corresponding signal displays a green light, which authorizes a train to proceed on the single track to LaFayette block office to pick up orders. On the other hand, if he wants to hold the train on the double track, he leaves the lever down and the signal displays a red indication. The indications displayed by these signals are repeated on the operator's panel so that he can be assured that the signals follow his lever movements. If a lamp in a signal burns out, the corresponding lamp on the panel is likewise extinguished.

Results Satisfactory

The installation was placed in service on February 24, and the resulting benefits in train operation are highly satisfactory, although the present traffic of 20 to 25 trains is not enough to demonstrate the merits with respect to increased track capacity. Non-stop train meets are every-day occurrences. A study was made of train movements under the new system of operation, in which 10 days were chosen promiscuously, and the totals showed that there were 153 meets on this territory, 34 of which were non-stop, 10 of these being between passenger trains, 14 between passenger and freight trains, and 10 between freight trains. This study revealed that of the 269 train stops eliminated in the 10 days, 61 were for passenger and 208 for freight trains. Thus on the average, 6.1 passenger and 20.8 freight train stops were eliminated daily, or a total of 27. In a year this totals 9,855 stops eliminated and, based on a very conservative figure of $1 saved for each stop eliminated, this amounts to $9,855 annually.

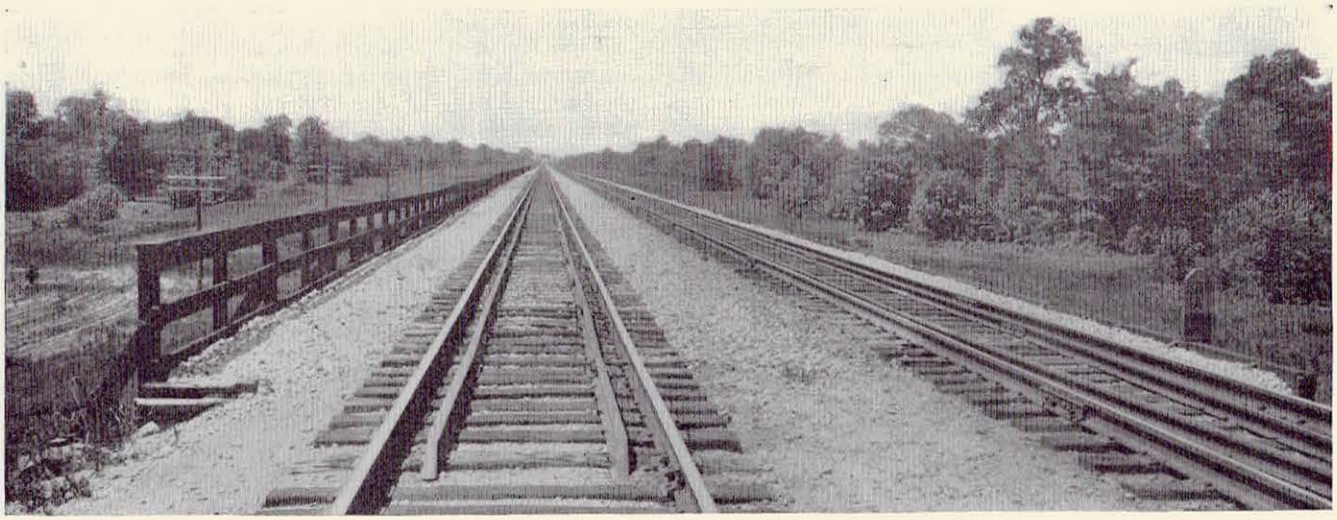
A comparison was made of the running time for trains before and after the centralized traffic control was placed in service, the period from January 1 to 10 being compared with that for March 11 to 20. The average time for freight trains was reduced from 1 hr. 26 min. to 1 hr. 16 min., in spite of the fact that 26 more trains were operated in the latter period. A second study comparing train operation for the period from April 21 to 30, 1929, with the period from April 21 to 30, 1931, showed an average saving of 24 min. for each freight train. In this case less powerful locomotives were used and 45 more trains were operated in the 1929 period than in 1931, necessitating certain allowances for these changed circumstances. However, based on the conservative time saving of 10 min. for each of an average of 12.5 freight trains daily, this totals 760 freight train hours annually, which, calculated at $9.69, totals $7,164 annually. This figure of $9.69 for a freight train hour is an estimated average for this division of the Wabash, and includes only such items as trainmen and enginemen's straight-time wages, fuel and water. The saving made possible by the reduction in the number of block and telegraph operators totals $14,000 annually.

Economic Statement for 37 Miles C.T.C. State Line to LaFayette and Remote Control Switches at Delphi Junction, Ind., and Clymers

Costs	
Centralized traffic control, LaFayette Junction to State Line	$145,000
Remote control switch Clymers, Ind.	9,700
Remote control switch Delphi, Ind.	7,300
Total Cost	$162,000
Additional maintenance materials, $50 per mile per year	1,850
Additional maintenance labor	None
Savings	
Savings by reduction of train hours, 12.5 trains per day, 10 min. each, equal 760 freight train hours at 9.69 per hour	7,364
Saving by reducing train stops to open and close switch, fuel, wear and tear on equipment 27 per day x 365 equal 9,855 no less than $1 per stop	9,855
Saving by reducing number of block and telegraph operators (Taking no account of saving in motive power or per diem of cars)	14,000
Total gross saving annually	$31,219
Total gross expense annually	1,850
Net Annual Saving	$29,369
Annual return on investment	18%

The three items mentioned total $31,219 annually, without consideration of the saving in motive power or per diem on cars. No additional labor is required for the maintenance of the new system. However, it is estimated that about $50 per mile or $1,850 annually should be allowed for additional maintenance materials. The centralized traffic control system on the territory from LaFayette Junction to State Line cost $145,000, and the remote control layouts at Clymers and Delphi $17,000, thus totaling $162,000. The annual saving of $29,369 represents a return of 18 per cent.

It should be noted that these figures are based on a present traffic of only 12.5 freight trains daily. When traffic returns to the 1929 normal of 20 to 28 freight trains daily, the savings on account of the elimination of delays and train stops will increase rapidly without any increase in the expense of operating the system. Even with the present minimum traffic, the system justifies itself from both the operating and economic standpoints. The completion of the installation on the territory from LaFayette to Peru will not require as high a proportionate cost as that for the first section because the investment has already been made for the control machine and the line circuits. It is estimated that the system can be completed on the additional 55 miles for approximately $110,000. Therefore, the savings brought about by the elimination of train stops, etc., will be higher in proportion to the investment. On the other hand, not as many operators can be released on the proposed extension as on the installation now in service, and this factor will tend to reduce the proportionate savings.



Ballast-Deck Trestle 983 Ft. Long, Dean Lake, Mo.

Putting Treated Timber To New Uses*

Atchison, Topeka & Santa Fe makes steady effort to find new application for this material

By R. S. Belcher

Manager, Treating Plants, Atchison, Topeka & Santa Fe, Topeka, Kan.

THE first treated wood used by the Atchison, Topeka & Santa Fe was creosoted piling treated at a plant at Galveston, Tex., in 1875, for use in the construction of the Bay bridge into Galveston. Our first crossties were treated at Las Vegas, N. Mex., in 1885, but it was not until 10 years later that we began to treat lumber and piling for inland use. Beginning with 1895, the amount of lumber and piling treated has increased steadily until in 1930 more than 19,000,000 bd. ft. of lumber and 895,000 lin. ft. of piling went through our plants. In addition, more than 425,000 cu. ft. of miscellaneous material was treated in 1930. Lumber, piling and miscellaneous timber amounted to only 15 per cent of the total timber given treatment during 1930, the remaining 85 per cent being cross and switch ties. Since 1895 more than 27,000,000 cu. ft. of lumber, 14,000,000 lin. ft. of piling and 4,000,000 cu. ft. of miscellaneous material have been treated and put into service on the Santa Fe.

Special Items for the Signal Department

During the past five years the signal department has used an average of approximately 588,000 bd. ft. a year of treated trunking and capping; a total of 3,800,000 ft. b.m. having been turned out at Santa Fe plants since 1923. All trunking and capping has been manufactured as well as treated at the treating plants, the sizing and grooving being done on a timber sizer at one operation by the use of special knives. The lumber is purchased in the proper sizes for manufacture in the rough and is worked to finished sizes and treated after four to six months' seasoning.

We have now started to manufacture, in the same manner as the trunking, a special molding for the protection of switch wiring. In use it is nailed to the sides of the switch ties. Treated gum blocks are also used to protect the switch rods and these are also manufactured at the treating plants.

In addition to these special items, the treating plants furnish the signal department with creosoted Southern pine poles which are roofed, grained and bored before treatment. The poles range from 30 to 40 ft. long, although both shorter and longer lengths are often required. Signal pole stubs are 10 ft. long, with tops not less than 8 in. nor more than 10 in. in diameter, bored for two ¾-in. bolts and roofed at a 45-deg. angle. In addition to the bolts, wire is used to bind them to the poles which they are to reinforce, and which are untreated. During the past five years, an average of 90,870 lin. ft. of poles and 18,280 lin. ft. of stubs, or 2,000 pieces, have been turned out by our plants. All signal material, including poles and stubs, receives an 8-lb. Reuping treatment with a 50-50 creosote-petroleum mixture. All poles for telegraph lines are furnished by the Western Union Telegraph Company and these are also creosoted Southern Pine.

Fence Posts

Posts for right of way fences are treated round pine, line posts being 7 ft. long and corner, gate and brace posts 8 ft. long. At cattle guards, the wing fences are supported by treated posts 9 ft. 6 in. long and 4 ft. 6 in.

* Abstracted from a paper presented at a meeting of the American Wood Preservers' Association at Philadelphia, Pa., January 27-29, 1931.

long. All posts used in standard stock yards are treated. Two lengths of round posts are used, 9 ft. for the outside fences and 8 ft. for the interior fences which divide the stock yards into pens. The stock yard chutes are supported by creosoted pine sticks of the proper length and size. The platform at the end of the chute may be supported by treated pile heads resting on treated plank sills, this type of support being also used commonly under cotton platforms and other structures of like character.

An average of 153,000 seven-foot line posts have been treated at Santa Fe plants annually during the last five years, in addition to 7,500 eight-foot corner posts. Likewise, an average of 2,548 stock-yard posts have been treated each year. On the Coast lines, however, it is the practice to split redwood ties that have failed because of plate cutting, spike killing, etc., and use them as fence posts.

On the Santa Fe, right-of-way signs are of three kinds: All-metal construction, metal signs attached to treated posts, and wooden signs and posts spliced to a treated timber base. The framing and boring of the treated posts and bases is done at the treating plants. Both the fence posts and the posts and bases for the signs are given a 5-lb. 50-50 creosote-petroleum treatment. The treated material for signs is painted with a mineral brown paint after it has weathered sufficiently to permit the paint to adhere.

Highway Crossings Planked

The old type of untreated planked road crossing is fast disappearing, and cut-to-fit treated plank and furring strips are furnished ready to put down with a minimum of labor in the field. The lumber is purchased in the rough and seasoned, after which all milling is done at the treating plants.

The planks are numbered to correspond with the standard or special plans to aid those making the installation. Important road crossings are fully planked. Unimportant highway and private crossings require only one plank each side of the rail, the space between being filled with ballast. Treated black gum, Western yellow pine and Douglas Fir or untreated Port Orford cedar are used, depending on the character of the crossings and the territory in which they are located.

During 1930, the treating plant at Somerville, Tex., produced 2,081,127 ft. b.m. of black gum crossing plank and furring, all of which was given an 8-lb. Reuping treatment of 50-50 creosote-petroleum mixture. All of the black gum timber is furnished from this plant, owing to its location near the source of supply. A principal advantage of black gum for this use is the fact that it has an interlaced grain, does not split readily and presents a tough, long-wearing surface, so that twice the life should be obtained from this wood that is given by yellow pine on heavy traffic crossings.

Material Treated for the A. T. & S. F., 1885 to 1930, Inclusive

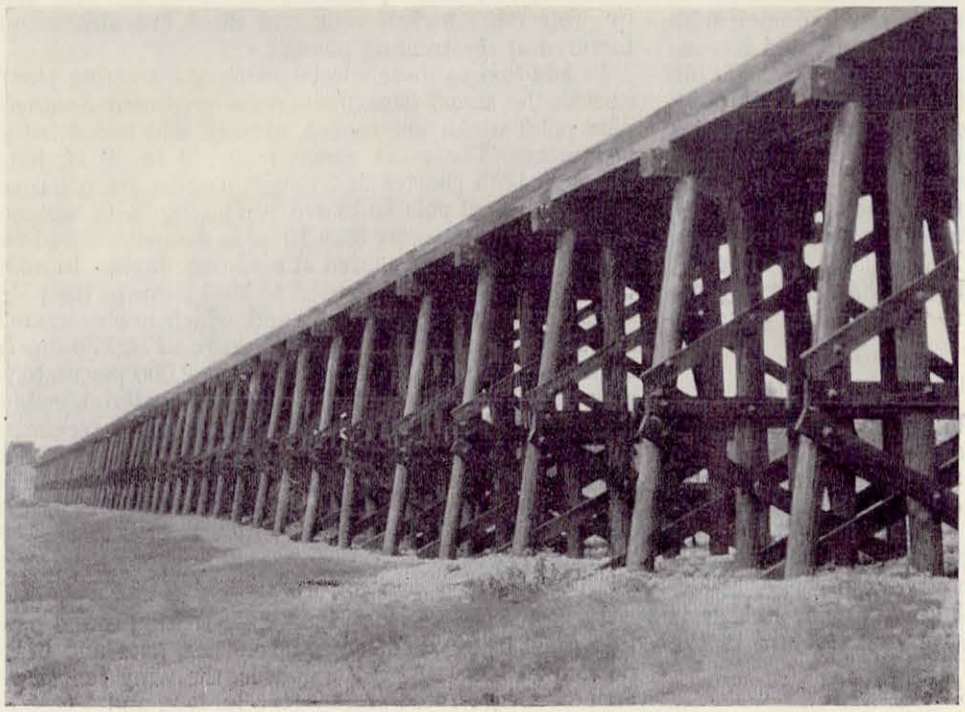
Kind of material	Pieces, board feet or lineal feet	Cubic feet	Per-cent
Crossties	98,817,620 pcs.	317,766,846	85
Switch ties	123,120,370 bd. ft.	10,272,275	3
Lumber	130,134,198 bd. ft.	27,506,555	7
Piling	14,699,139 lin. ft.	13,903,546	4
Miscellaneous	.....	4,029,190	1
Total		373,478,412	100
	1930		
Crossties	5,099,134 pcs.	15,730,469	82
Switch ties	8,214,743 bd. ft.	684,580	3
Lumber	19,689,360 bd. ft.	1,641,154	9
Piling	895,151 lin. ft.	811,572	4
Miscellaneous	.....	424,524	2
Total		19,292,299	100

Wood Block Floors

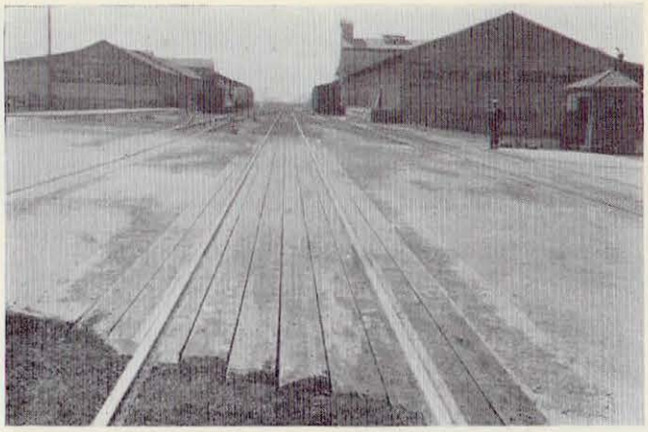
There is nothing particularly new about the use of treated wood block floors, but they constitute one of the important uses of creosoted wood. On the Santa Fe, creosoted blocks have been used for machine shop floors in many locations and have given excellent results. Since 1920, approximately 72,000 sq. yd. of creosoted wood blocks have been used by this road, of which 62,000 sq. yd. was for inside flooring and the remainder for outside use, principally on platforms.

All timbers for 150-ton and 100-ton track scales and 10-ton stock scales are now preframed, prebored and treated. The scale department reports that cut-to-fit timbers are more convenient and economical to install.

There is an increasing call for treated lumber which can be painted. Some experimental work has been done



Only Eight Treated Timbers Were Cut in the Field in Constructing This 65-Bent Ballast-Deck Pile Trestle



A Crossing Planked With Creosoted Black Gum

along these lines with lumber treated with zinc chloride. In one test over a period of 13 years, it has been determined that paint wears as well on this material as on the untreated surfaces, and that the lumber is still in excellent condition.

Bridge Timbers and Drain Boxes

The greater part of the 19,689,360 bd. ft. of lumber treated during 1930 at the Santa Fe plants—in fact, the greater part of the lumber treated every year from the beginning—has been used in timber bridges and wooden drain boxes. All drain box covers, bottoms, side-wall braces, etc., are cut to length at the treating plants to avoid cutting in the field, and the resulting decay of exposed untreated wood. Many instances of such decay indicate how necessary it is to protect the untreated ends of timber when cut after treatment. Better and more uniform results are obtained, however, when all parts of a treated structure are cut to length, machined, bored, etc., before treatment. In 1930, our treating plants furnished a total of 2,209,000 ft. b.m. of material for this purpose.

For several years, the bridge men on the Santa Fe have accomplished splendid results in the construction of timber bridges without sawing treated material to length in the field. In one case, a ballast-deck pile trestle of 65 bents was constructed with the cutting of only eight timbers, all of which were sway braces, and the ends were well treated with hot creosote and hot sealing compound after cutting. On another division, 2,618 ft. of ballast-deck bridges were constructed in one year without cutting a single piece of treated timber in the field, other than the piles at the cap line. It is our practice to treat bolt holes with creosote and sealing compound, although the exact method of doing this has not as yet been made standard. The sealing compound is a mixture of creosote and coal tar pitch, approximately 20 per cent of the former to 80 per cent of the latter. It is heated and applied hot, except to protect the tops of piles, in which case it is to be only lukewarm.

Construction Practices

An example of the many applications of treated timber by this road is found in the construction of the Clinton & Oklahoma Western, a subsidiary line between Pampa, Tex., and Cheyenne, Okla., 81 miles, which was built in 1928 and 1929 to provide a connecting link between Santa Fe lines and the Kansas City, Mexico & Orient, now a part of the Santa Fe system.

Creosoted wood-box culverts were used in all embankments not exceeding 13 ft. high, more than 780,000 ft. b.m. of treated lumber being required for this purpose. In general, pile trestles were of the ballast-deck type, with six piles to the bent. Creosoted material was used throughout, the requirements being 110,000 lin. ft. of piling, 130,000 ft. b.m. for caps, 710,000 ft. b.m. for stringers and 370,000 ft. b.m. of other timbers, or a total of 1,210,000 ft. b.m. About 300,000 crossties and 200,000 ft. b.m. of switch ties, all of which were creosoted, were used in laying the tracks and turnouts.

Grade crossings were eliminated at important highways and elsewhere, where practicable. Creosoted black gum planking was used at all crossings remaining at grade, 62,000 ft. b.m. being required in this application. For fencing the right of way, creosoted posts and braces were used, the requirements for this work being 52,000 fence posts and 40,000 ft. b.m. of bracing.

In constructing station and other buildings, creosoted material was used wherever practicable to do so. The foundations consisted generally of creosoted pile heads, while sills and girders, posts and lumber in stock yards, curbs for platforms and other timbers in contact with the ground were all creosoted material.

For some time past we have been revising the plans for open-deck and ballast-deck treated timber trestle bridges. In these plans, every precaution is being taken to design the bridges so that practically every piece of treated timber may be sized and cut to length before treatment and even to provide for the preboring of a large percentage of the bolt holes. In our opinion, most important of all, perhaps, except proper treatment of the timber, is the use of presized, prebored and preframed treated timbers, and the careful protection of cut-offs, bored holes, etc., where preframing, preboring, etc., is not possible.

Test Locomotives of 4-8-2 and 2-6-6-2 Types on the B. & O.

(*Continued from page 49*)

basis for this conclusion. The economy is also reflected in the high over-all thermal efficiency obtained at the drawbar.

A relatively high average speed was maintained over the division, together with an average drawbar pull of approximately 48,000 lb., indicating that the large driving wheels were a distinct advantage in maintaining a fast schedule for tonnage trains.

Owing to the fact that an apparently large drop in pressure between the boiler and steam chest is shown, some explanation in regard to the source of these figures is felt to be necessary. The averages include the steam-chest pressures observed while the locomotive was working with a restricted throttle opening for short periods. With full throttle opening and under good operating conditions, this drop was observed to be only about 10 lb. A study shows that the two units of the engine are well balanced, developing approximately the same horsepower. Although indicator cards were not taken with the object of determining maximum horsepower, they show that this would be reached at a speed well above 35 miles an hour.

As a result of these tests it is evident that a single-expansion articulated locomotive of the 2-6-6-2 type with 70-in. drivers will meet the actual load and clearance restrictions imposed, and still afford sufficient boiler capacity equivalent to cylinder requirements and give economical performance.

Give Us Machines, Say Supply Winners

LIFT trucks, tractors and trailers, and automobiles, are among the things the front-line troops of the railway supply and repair departments need to contribute their share in aiding the railroads to weather their economic battle, according to the two winners of the fourth annual competition for ideas on supply work, conducted by the Purchases and Stores Division of the A. R. A. during the year. As announced in the *Railway Age* of May 16, this contest, which was open to all employees and junior officers in railway purchasing and supply departments, closed with the awarding of the honors equally to E. J. Dennedy, a stock clerk on the Baltimore & Ohio, at Ivorydale, Ohio, for a paper on the use of mechanical power in stores work, and to William Courage, a store foreman on the Canadian National at Winnipeg, Man., for a paper outlining a method of avoiding surplus material.

Within the past few years, said Mr. Dennedy, the supply departments have been giving serious attention to the most economical methods of handling materials from the time they are received from the manufacturers until they are delivered to the points of consumption, remembering that every time a piece of material is handled its cost is increased, but not its value. It is to eliminate this extra cost and wasted energy involved that the use of machines should be adopted. This opens up a broad field, which will produce more dollar-for-dollar returns on the investment than any other.

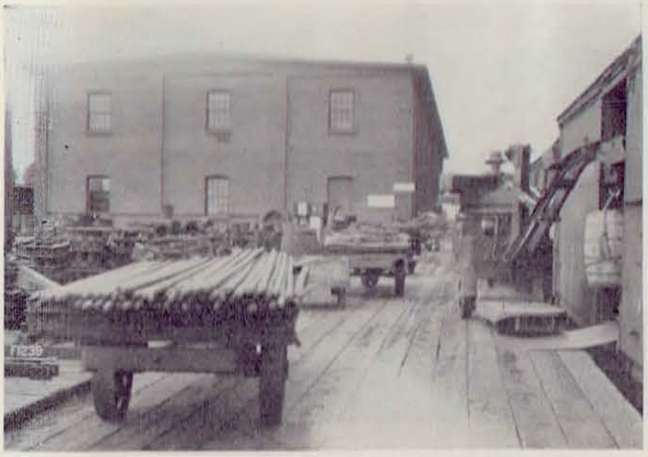
Lift Trucks Save Handling

Continuing, Mr. Dennedy said in part: The lift truck and skid method of storing and shipping materials is destined to become the foremost labor-saving device for the economical handling. This method has passed the experimental stage and has reached the point where it offers an opportunity for economies far-reaching in effect. Power lift trucks may be secured in almost any capacity, ranging from 1 to 20 tons, and designed to fit almost any need. Likewise, skids can be made to suit almost any class of material to be handled, and are so inexpensive that it is economical, once material is placed on skids, to keep it there until used or shipped, thus eliminating many re-handlings.

This system will be found economical for the transfer of material between major and division stores. It also reduces the time of loading and unloading cars. Its prime object, however, is to eliminate the excessive picking up and laying down process of material handling. Economy in moving material is obtained by not handling it. Labor that formerly took days to handle can be reduced to hours. The time is not far off when most materials will be received from the manufacturers in lift-truck skids, and this method will, to some extent, displace store-room cases and bins.

Electric Crane Trucks Handy

The electric crane is applicable to every railroad plant where unusually cumbersome or heavy objects must be lifted or transported. It loads and unloads heavy material in a minimum length of time, thereby expediting the movement of cars and relieving congestion around storehouses. It picks up and carries such commodities as sheet steel, tires, driving boxes, air pumps, and side rods. It stacks and carries pipe or bar stock, and handles scrap. In the erecting shop, it can be used to remove a front door, steam dome, pump, or generator from a locomotive, and to make a new application in a short space of time. It increases shop production through speedy delivery and application of material. The old method was to carry material into shops by man-power. The crane, operated by one man, performs the same work in about one-fourth the time in a safe, efficient, and economical manner. Labor that formerly totaled hours in time of handling has now been reduced to minutes.



Handling Material with Crane Trucks and Tractors on the Great Northern

Automobiles Pay—Tractor and Trailers Proved

Auto-trucks should be adopted for many of our needs. They are wonderful time and labor savers. There are few terminals where they cannot be used to advantage. Of late years, some of our larger roads have found it necessary to install a number of trucks at certain terminals where, at first, it was doubtful whether the installation of one truck would pay. Terminal storekeeping is one phase of stores work where automobiles are an absolute necessity in order to render the proper service.

There is not a railroad using the tractor and trailer

Tractor Operation in Scrap Handling on the C., B. & Q.

system that has not found it efficient and economical. For shop delivery or long, heavy hauls, the tractor-trailer method will surpass all expectations as a time and labor saver. In former years, it was a common sight to see eight or ten men trailing back and forth from the store-room with material. This new plan of material delivery makes it necessary for only one man with a tractor and a number of trailers to deliver most of the shop or car yard requirements and at the same time pick up scrap or repaired articles and return them to the storehouse. The proper application of this principle will save many thousands of dollars annually.

How to Avoid Surplus Material

In this paper, the Canadian stores foreman advocated the need and way of better anticipating material requirements. The recent industrial depression, said Mr. Courage, has accentuated the fact that a considerable percentage of the material acquired by the stores invariably becomes inactive and that great savings would be accomplished if all data concerning possible requirements were intelligently consolidated and placed promptly before the stores department.

While railroad managements have not yet reached the stage where shopping programs can be arranged two or three months in advance, and adhered to, Mr. Courage contended that data are always available at the repair departments, which, if consolidated, would be of incalculable value to the stores department, and he presented a plan as follows:

Each responsible officer should delegate an intelligent and competent representative, familiar with the many material requirements of his department, to co-operate with the stores. These representatives, being familiar with material, could compile and follow a list of anticipated requirements, paying attention to all special and more expensive material. They could furnish the stores, week by week and month by month, with enough valuable data to warrant their employment. Such a representation could find a fertile field for research at points of equipment inspection.

Again, when the equipment appears for general repairs, such a representative could readily forward to the stores a list of all material required to repair it. The stores department, aided by the data gathered from the several representatives, would then be in position to secure the material required, and have it on hand when required without carrying an excessively large stock. Having the material ready, it could supply the demand expeditiously. Material specialists representing each major using department and operating under stores direction should be appointed.

Many Advantages

The constant personal contacts established are full of possibilities, concluded Mr. Courage. Valuable time would be saved by the elimination of much confusing interdepartmental correspondence. The improvements in relationships would also tend to overcome interdepartmental interference, apparent in most large industries. The using department men, by their intimate knowledge of the use of the material, would be invaluable to the stores in disposing profitably of material which has become surplus and is in danger of becoming obsolete. The plan should reduce stores stock and material shortages. The latter would be attractive to using department officials and employees, stimulating interest in their material supply.

A New Type of Track Maintenance Unit

FAIRMONT Railway Motors, Inc., is now introducing a new type of track-maintenance unit known as the Fairmont Mogul. This machine is essentially a gas-electric locomotive weighing 86,500 lb., which is mounted on an all-steel, flat-deck, electric-welded body, 46 ft. long. While designed primarily for use as a ditcher and a ballast and roadbed shaper it can also be used, by the addition of the proper equipment, as an electric crane, a snow plow, a flanger or a ballast plow. Being self-propelled and having ample speed and tractive power, it eliminates the necessity for a steam locomotive for work-train service when it is employed in ditching or other maintenance operations, and it can also be used in emergencies to provide power for switching and train service.

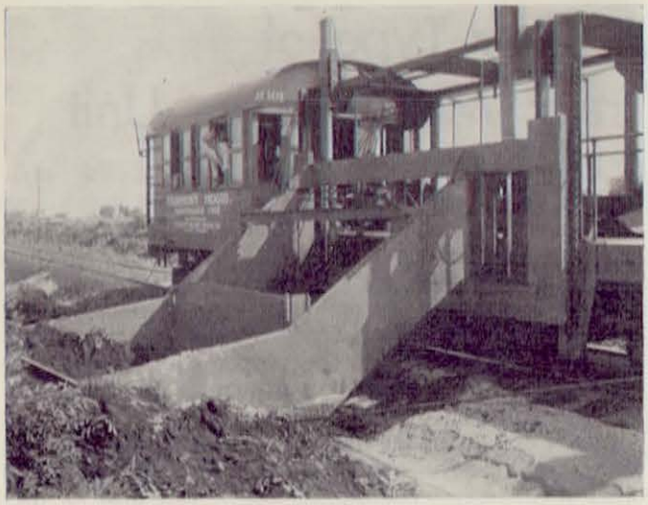
Observations made of its performance in regular service over a period of 11 days while it was engaged in ditching cuts and shaping the ballast and roadbed indicate its possibilities. Of a total crew time of 115 hr. 30 min., or an average of 10 hr. 30 min. a day, 59

Fairmont Mogul with Wings Folded Against Side of Car

hr. 20 min. represented the actual working time, a daily average of 5 hr. 24 min. In this period of 11 days, 86.7 miles of ballast and subgrade was shaped on one side in 51 hr. 20 min., equivalent to 43.35 miles shaped on both sides at the rate of one mile in 1 hr. 11 min. Likewise, 7,000 lin. ft. of ditching was completed in 8 hr., involving the removal of 1,410 cu. yd. of material at the rate of 875 ft. of ditch, or 176 cu. yd. of material, an hr. During this period, the unit ran 565.5 miles, while the actual working mileage was 88.2. The total consumption of gasoline was 783 gal., and of lubricating oil 71 gal. daily averages of 71 gal. and 0.91 gal. respectively.

The daily cost of operation was $108.44, which included the wages of the crew, the cost of fuel and supplies and an overhead charge of $61.50 for interest, depreciation and maintenance. An average of 4.56 miles of equivalent single track was fully shaped on both sides in each day of 10 hr. 30 min., giving a cost of $23.78 a mile for shaping the roadbed. On the same basis the cost per cubic yard of material removed in ditching was 11.4 cents.

There are five major assemblies in the Mogul, any-one of which can be removed as a unit: (A) The front and rear trucks, both of which are arranged for electrical drive; (B) the frame; (C) the power plant, which is mounted on a sub-frame; and (D) the cab, which is electrically welded into one piece. The power plant has a capacity of 175 hp., while space is provided



Duplicate Wings Facilitate Ditching

for the installation of duplicate power units, or for the exchange of the original set for another up to 350 hp., which will double the tractive effort, if motive power requirements increase to this extent.

The ditching and ballast-shaping wings, which fold against the body of the car when not in use, are mounted on a special frame which is applied to the body of the car by means of bolts or pins. Both the vertical and swinging movements of these wings are controlled by oil cylinders under pressures up to 400 lb. per sq. in.

Duplicate wings, provided with cutting edges of special steel and separated by a diaphragm which forms a pocket of about eight cubic yards capacity, make it convenient to work in either direction when ditching. When the pocket is filled, it can be discharged on the shoulder of the embankment beyond the cut. The ballast shaper is likewise designed to retain 5½ cu. yd. of ballast, distributing the excess at slack places.

This unit is designed and built in accordance with recognized railway standards and practices. Brakes, draft gears, trucks, etc., conform to the standards of the A.R.A., while the safety appliances meet the requirements of the I.C.C. rules. This design permits the standards of any railway to be met with respect to any equipment not made by Fairmont Railway Motors, including safety appliances, trucks, draft gear, braking equipment, sanders and other special equipment. For this reason, repairs or replacements can be made from stock materials in any shop on a system, without waiting for special parts. Because of its construction, this unit can be placed in any part of a freight train for shipment as an ordinary freight car, the only preparation necessary being to disconnect the gears of the traction motors. To return the unit to service, it is only necessary to run the compressor for a few minutes to charge the braking system.

Since all removable parts are in the steel cab, which can be locked, it is unnecessary to run the unit to a terminal or employ a watchman overnight. The regular supply tanks hold sufficient fuel and lubricating oil for 24 hr. continuous service, so that by eliminating the delays incident to taking coal and water and by tying up at convenient points overnight, the factor of productive use is increased as much as 25 per cent.

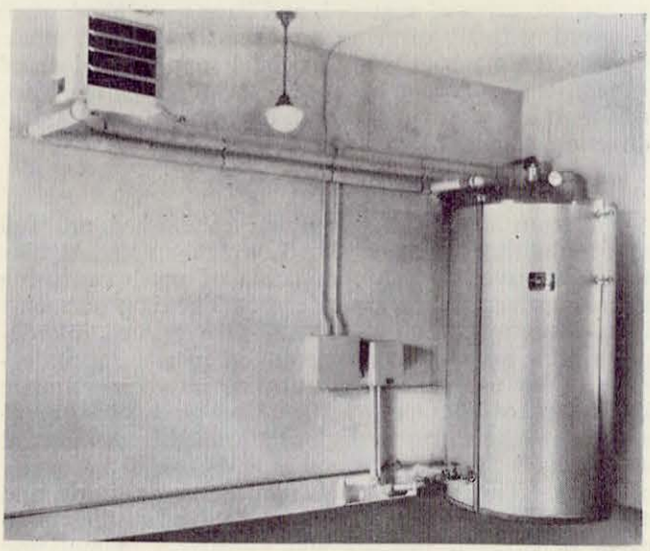
On sanded rails, the maximum drawbar pull is 21,000 lb., while on smooth rails it is 12,500 lb. The effective drawbar pull ranges from 10,000 lb. at 2 m.p.h. to 1,000 lb. at 25 m.p.h., so that, when operating as a locomotive, the unit will handle a gross train load of 1,600 tons at 2 m.p.h. on level track, or 170 tons at 25 m.p.h. On a 2 per cent grade, these ratings become 208 tons and 22 tons at the speeds mentioned. The maximum free-running speed of the unit in both directions with the motors in gear is 30 m.p.h., and when out of gear 60 m.p.h. The overall length of the car body is 49 ft. 5 in., and over the end sills 46 ft. 1 in. The maximum width is 10 ft. 1 in.

Electric Heating With Off-Peak Power

A COMPLETELY automatic system of electric heating, based on a thermal storage plan, has been developed by the Hall Electric Heating Company, Philadelphia, Pa., for use in railway waiting rooms, ticket stations and other buildings in electrified territory, where advantage can be taken of exceptionally low power rates during off-peak hours.

Among the outstanding advantages claimed for this new system of heating are: (1) It requires no attention other than the occasional adjustment of the thermostatic control dial to the desired temperature setting, and, therefore, no charges are made for labor in connection with its operation. (2) Neither smoke nor fumes are generated, and, for this reason, the system permits an economical departure from present building standards, in that chimneys and fuel bins are not required. (3) Since the fire hazard is greatly reduced, lower insurance rates can be had. (4) More efficient utilization of the existing power supply means lower energy rates. A time switch automatically connects the heating system with the power supply during pre-determined low-demand periods, aid disconnects the system during the peak-demand morning and evening rush hours. By reason of taking power only during these low-demand periods, it is claimed that a power rate can be obtained that puts this system on a basis that is competitive with coal or oil systems.

The "Hallmark" electric heating system, as it is known, is applicable to any existing hot-water radiation



View of a Typical Storage Tank with Control Apparatus and Unit Heater

heating plant or to any unit heater system. It comprises a storage tank which is insulated with mineral wool and surrounded by an outside sheet metal housing. Heating elements of various capacities, depending upon the requirements of the particular installation, are inserted in the tank, and operate on the existing service. The water in the storage tank is heated to a maximum temperature of 300 deg. F., and is under pressure control. A motor valve in the supply line to the heating unit operates under the control of a wall-type thermostat to control the flow of the hot water from the tank to the heating units. The system may be adjusted to heat the building to any desired temperature and to control this temperature automatically.

The manufacturer states that electrical energy for the operation of this system may be provided on an off-peak basis at a rate of from 6 to 9 mils per kw. hr., the use of this energy being made available automatically during a charging period of 17 or 18 hours. The system is provided with sufficient capacity to maintain the required temperature during the remainder of the 24 hours each day.

Rail-Truck Service of Two Electric Lines

(*Continued from page 45*)

In addition to this service, a local trucking concern in Milwaukee and one in Chicago own and operate a company which is called the North Shore Forwarding Company. Using the "ferry truck service," this company consolidates small shipments which are loaded in the ferry trucks, giving the shipper the advantage of a lower rate, plus North Shore service.

The Chicago, South Shore & South Bend, an electric railroad operating between Chicago and South Bend, Ind., a distance of 90 miles, is using a "truck" service similar to that used by the North Shore, except that the movement of all trailers to and from stations and shippers to rail heads is done by contract with a trucking concern. Under this arrangement it is possible for the North Shore to compare the trucking cost of moving its trailers with the trucking cost of the South Shore, where the service is hired service. There are 400 to 500 ferry truck loads per month to and from the Chicago stations.

Recently the Shore Line Forwarding & Distributing Company was organized by a number of trucking companies in Illinois, Indiana, Michigan and Ohio. This concern consolidates package freight in trailers, which are loaded into standard drop-end gondola cars on the South Shore and shipped by rail to and from Chicago and South Bend. The forwarding and distributing company receives the benefit of a carload rate for shipment of these trailers, and the railroad can perform this service at less cost and with more dispatch than a trucking company can haul this freight to and from South Bend and Chicago.

A great deal of experience has been gained by these electric railroads in the performance of their various trucking services. Co-ordination of railway and motor truck operations is gradually being worked out that will permit the motor truck to perform its economic service for the shipper—that of pick-up and delivery, or short haul service—and the railway to perform its economic service for the shipper—that of hauling bulk loads to distances that are too far for the motor truck, or through congested highway areas.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended June 27 amounted to 759,290 cars, an increase of 20,174 cars as compared with the week before. As compared with last year, however, this was a decrease of 177,400 cars and as compared with 1929 it was a decrease of 337,279 cars, the largest decrease as compared with the loading for a corresponding week of that year that has yet been reported. The loading for the week was less than that for the corresponding week of any year since carloading figures have been compiled except 1919, and the total loading for four weeks of June has been less than for any June since the compilation was begun in 1918.

For the first 26 weeks in 1931 the total loading has been 18,979,984 cars, as compared with 23,200,576 cars in the corresponding period of 1930 and 25,616,953 cars in the corresponding half of 1929. It was the lowest 26-week total on record except that for the first half of 1921, when the total loading was 18,685,921 cars. The decrease as compared with last year is over 13 per cent and as compared with 1929 nearly 26 per cent.

Loading of ore was 30,882 cars less in the week of June 27 than in the corresponding week of last year, while merchandise loading showed a decrease of 23,215 cars and miscellaneous loading a decrease of 74,461 cars. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading

Week Ended Saturday, June 27, 1931

Districts	1931	1930	1929
Eastern	173,512	209,663	254,562
Allegheny	143,211	189,705	226 084
Pocahontas	48,354	52,625	61,836
Southern	108,819	126,603	140,379
Northwestern	103,887	145,816	176,200
Central Western	117,329	137,934	156,634
Southwestern	64,178	74,344	80,874
Total Western Districts	285,394	358,094	413,708
Total All Roads	759,290	936,690	1,096,569
Commodities			
Grain and Grain Products	41,859	48,846	51,963
Live Stock	18,810	20,543	22,973
Coal	119,137	137,521	162,055
Coke	5,079	9,391	12,277
Forest Products	30,621	47 947	69,498
Ore	30,152	61,034	76,657
Merchandise L.C.L.	216,229	239,544	260,705
Miscellaneous	297,403	371,864	440,441
June 27	759,290	936,690	1,096,569
June 20	739,116	920,645	1,069,874
June 13	732,453	926,066	1,069,670
June 6	760,890	935,582	1,055,768
May 30	710,934	860,064	972,825
Cumulative total, 26 weeks	18,979,984	23,200,576	25,616,953

The freight car surplus for the week ended June 23 averaged 628,554 cars, an increase of 2,504 cars as compared with the previous week. This included 325,657 box cars, 232,730 coal cars, 30,960 stock cars, and 15,362 refrigerator cars.

Car Loading in Canada

Revenue car loadings at stations in Canada for the week ended June 27 totaled 50,427 cars, a decrease from the previous week of 1,561 cars, and a decrease of 12,586 cars from the same week last year.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada		
June 27, 1931	50,427	23,798
June 20, 1931	51,988	23,187
June 13, 1931	52,173	23,673
June 28, 1930	63,013	30,076
Cumulative Totals for Canada		
June 27, 1931	1,257,845	719,944
June 28, 1930	1,530,864	921,012
June 29, 1929	1,706,560	1,108,546

Less Government Activity One Cure for Depression

IF the tax burden that hangs like a threatening cloud over American farms, homes and industry could be lifted, we would then begin to feel the bright and healing rays of the sunshine of prosperity, according to Fred W. Sargent, president of the Chicago & North Western, in an address before the Economics Club of Chicago on June 11.

"All industry and all business," Mr. Sargent said, "must be conducted at the risk of changing economic conditions, new inventions and new processes, and subject to the dangers of loss arising out of competition from private sources. This is one of the ordinary risks that all investors take when they embark upon any enterprise. Government competition, however, does not fall within this class of ordinary risks, because every citizen has the right to suppose that his government will be just and will not, through direct legislation, use the power and resources of all the people to destroy the business, the savings and investments of a part of the people. Government in business is a form of competition, the risk of which private investors never had any right to believe they would have to assume. When the public generally becomes imbued with the fear that their government is going to destroy their investments by entering into private competition, then those investments will cease and seek refuge in other quarters, and the main source of prosperity will be dried up.

"No single thing could happen which would give more courage and inspiration to the revival of prosperity than to know the government intended to maintain a sacred regard for the rights of private property, as those rights have heretofore been supposed to be protected and guaranteed under the provisions of the Federal Constitution.

"The government in business means increased taxes on the remaining private business which it permits to survive, and taxation is the road to poverty, not prosperity. Excessive taxation withdraws capital from the field of productivity. It destroys industry, creates unemployment, and clogs the channels of trade and commerce. It is responsible for more suffering among wage earners than any other single cause.

"When government activities create tax burdens that threaten prosperity, it is time to call a halt and permit the people to catch up with the laws already enacted. Let us keep to the right and travel the road of individual initiative responsibility, energy and determination, that leads to the greatest prosperity and happiness for the greatest number of all our people. That is the road that has proved the safest so far. Along it we have acquired more automobiles, radios, homes, hospitals, libraries, schools, telephones, and more of the ordinary comforts of life per capita, and more widely distributed among all the people than any other government on any other part of the globe, or in any other period in the world's history.

"Let us not follow false prophets that lead us into the wilderness of confiscating taxation and a paucity of the people's income. True, we are in the midst of a depression, many of our people are suffering, but the remedy will be found in less government activities, not in more. If the tax burden that hangs like a threatening cloud over American farms, homes and industry could be lifted we would then begin to feel the bright and healing rays of the sunshine of prosperity."

Communications . . .

Exhibiting Locomotives to Students

DENVER, COLO.

TO THE EDITOR:

On "Engineers' Day" at the University of Colorado, (Boulder, Colo.), which is sponsored by the engineering societies in this section, the engineering students at the University of Colorado inquired of the Burlington Railroad if it would care to place one of its large engines on exhibition. This request was granted and the engine brought forth considerable favorable comment, particularly from the younger boys and girls in the high and preparatory schools.

It seemed to the writer that if the railroads would endeavor to foster such exhibitions among, not only the technical schools, but even in the grade and high schools, a very favorable impression of the railroads would result, as very few people realize the first cost and the cost of maintenance of a modern locomotive, and the younger generation with these figures in mind would be of great value to the railroads both at the present time and in the future.

A. W. AINSWORTH.

Motor Vehicle Taxes

PONTIAC, MICH.

TO THE EDITOR:

In the "Communications" department of the April 11 issue of your magazine, there is a discussion by J. M. Farrin, special engineer of the Illinois Central, regarding the allocation of highway taxes. While I do not wish to quarrel with Mr. Farrin regarding the principles which he uses, there are several factors entering into his calculations which are somewhat questionable. As a result of his use of these factors in making an allocation of taxes, the motor truck draws a disproportionately large tax assessment. It would be well to consider some of these factors in connection with other data which apparently Mr. Farrin did not have at his disposal.

The increased annual cost of Illinois highways, due to heavier construction on account of motor trucks, is set at $9,913,000. In other words, this is the maintenance, interest and depreciation on $121,000,000, or 12½ per cent of the total cost of improved highways in the State of Illinois. Mr. Farrin estimates that the average automobile weighs 6,000 lb., and that any vehicle above that weight occasions an increased pavement cost. T. H. MacDonald, chief of the Bureau of Public Roads, in recent testimony before the Interstate Commerce Commission, estimated that no increase in pavement section is needed until a weight of 5 tons is reached, when about eight per cent increased thickness should be allowed, and that for vehicles of 7½ tons the increased thickness needed is 15.4 per cent.

It should be understood that these percentages do not mean similar percentage increases in the cost. An increase of thickness will result in an increase in the cost of paving only, which is probably less than 75 per cent of the total cost. The additional cost of increasing the thickness of a concrete pavement with the construction crew on the ground is probably only that for the mixing and placing of the materials. With a 50 per cent split between material and labor cost, an 8 per cent increase in thickness would give a 4 per cent increase in the cost of the pavement. This would result in a 3 per cent increase in the cost of the highway for the 5-ton truck. For the 7½-ton truck, this increase would be 6 per cent.

Therefore, granting that all trucks which use the highways were 7½ tons in weight, the increase in the cost of Illinois highways would be about $60,000,000, and the carrying cost about one-half that shown by Mr. Farrin. Since only a small percentage of the common carrier trucks are 7½ tons in weight, it is quite apparent that the increase in the cost of Illinois highways due to truck traffic is probably only a very small fraction of the figures quoted by Mr. Farrin, and, if

Mr. MacDonald's testimony is to be believed, for the 8,000 lb. average truck weight used by Mr. Farrin, no increase in cost would be necessary.

In regard to the matter of damage to the roadway through the use of the heavy vehicles, based on Older's formula (now almost entirely discredited by practical design), the conclusion that an 8,000 lb. axle load damages the highway twice as much as a 4,000 lb. axle load, disregards entirely the fact that, with balloon tires on dual wheels, the weight per square inch of tire contact is not increased by the heavy vehicle. It is simply spread over a larger surface. There is a strong possibility that, with a correctly designed pavement, the stress imposed by commercial vehicles is no more severe than the more highly concentrated passenger automobile wheel loads.

It is apparent from all discussions that have gone forth that observers are deceived by the bulky appearance of trucks and buses on the highways. The refinement of design which uses the strongest and lightest materials in our present motor trucks and buses is such as to produce a very low tare weight ratio. It is possible in a passenger bus to design a vehicle of excellent operating performance with a weight of 250 lb. per passenger, which compares with 600 lb. for the average passenger automobile, 800 lb. for a trolley car and 1,200 lb. for a railway passenger car. A truck which will carry as much merchandise freight as a freight car weighs less than one-third as much as the car.

The railroads have had their experience with the 48 different types of existing regulation. When this same regulation is extended to cover the operation of hundreds of different types, sizes and conditions of equipment and systems of driving, on a narrow gage, double track highway without turnouts or passing tracks, some picture can be obtained of the present problems of the highway operator. Mr. Farrin's suggestion of the use of the gross ton-mile as a measure of use, if rightly applied, is probably as good as any. There is, however, little probability that it will be generally adopted or rightly applied.

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Revenues and Expenses of Railways

MONTH OF MAY AND FIVE MONTHS OF CALENDAR YEAR 1931

Name of road		Av. mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	General	Total	Operating ratio.	Net from railway operation.	Operating income (or loss).	Net ry. operating income.	Net ry. operating income, 1930.
Akron, Canton & Youngstown	May	171	$171,752	$64	$180,585	$24,360	$17,383	$12,371	$50,502	$17,510	$122,126	67.6	$58,459	$45,107	$31,206	$47,652
	5 mos.	171	825,415	382	867,146	102,618	85,344	63,767	264,245	75,292	590,793	68.1	276,353	213,616	141,682	229,391
Alton & Southern	May	30	104,185	.....	106,023	10,359	7,325	5,592	35,205	4,370	62,851	59.28	43,172	32,671	30,904	24,204
	5 mos.	30	448,156	.....	452,897	48,447	33,130	25,431	170,488	23,406	300,932	66.45	151,965	106,331	99,987	113,151
Atchison, Topeka & Santa Fe	May	9,670	8,809,709	1,895,137	11,888,330	2,241,996	2,793,379	409,851	4,128,769	443,013	10,001,208	84.1	1,887,142	885,309	879,733	1,217,911
	5 mos.	9,653	44,819,453	9,343,502	60,142,840	9,128,694	14,289,940	2,041,643	20,494,056	2,198,349	48,113,552	80.0	12,029,288	6,897,365	6,841,449	7,974,321
Gulf, Colorado & Santa Fe	May	1,976	1,245,830	79,549	1,441,611	277,818	389,744	58,046	548,133	69,841	1,335,149	92.6	106,462	8,592	—109,419	—132,203
	5 mos.	1,976	5,853,264	436,943	6,793,416	1,370,409	1,772,260	290,220	2,678,693	396,652	6,494,269	95.6	299,147	—189,247	—736,930	—770,644
Panhandle & Santa Fe	May	1,877	708,721	58,217	838,552	111,256	215,880	19,878	299,378	38,461	684,674	81.6	153,878	101,241	—10,949	—213,812
	5 mos.	1,754	3,524,632	319,891	4,184,587	886,893	1,075,388	103,857	1,499,441	193,837	3,740,092	89.4	444,495	163,705	—354,922	—550,130
Atlanta & West Point	May	93	99,023	29,733	151,454	26,741	33,195	9,429	65,985	11,453	150,852	99.6	602	—11,024	—24,389	—14,564
	5 mos.	93	543,695	150,385	813,733	109,891	159,537	52,712	339,454	58,860	738,714	90.8	75,019	16,664	—31,317	42,482
Western of Alabama	May	133	107,363	32,694	157,793	24,416	41,337	10,251	60,402	12,078	151,625	96.1	6,168	—4,121	3,477	11,628
	5 mos.	133	612,451	160,530	869,667	131,683	199,449	56,144	318,134	60,939	783,257	90.1	86,410	25,928	62,219	154,230
Atlanta, Birmingham & Coast	May	639	236,985	10,690	281,317	73,012	76,763	25,913	142,832	20,358	347,709	123.6	—66,392	—82,364	—96,749	—85,895
	5 mos.	639	1,281,956	52,583	1,500,119	369,966	371,142	134,749	717,255	98,109	1,738,640	115.9	—238,521	—318,511	—421,038	—331,571
Atlantic Coast Line	May	5,162	4,376,223	540,847	5,355,569	708,095	916,745	130,687	1,831,825	174,243	3,791,595	70.8	1,563,974	1,063,420	848,730	421,590
	5 mos.	5,162	22,111,832	4,969,123	29,799,100	3,634,570	4,850,881	759,941	9,645,628	884,252	20,089,294	67.4	9,709,806	6,958,012	5,734,344	5,741,173
Charleston & Western Carolina	May	342	199,567	5,747	212,526	30,402	26,751	6,474	79,988	6,453	149,975	70.6	62,551	42,573	33,662	7,421
	5 mos.	342	1,056,409	24,723	1,120,547	175,618	153,511	36,689	418,513	31,981	815,787	72.8	304,760	204,759	177,278	76,503
Baltimore & Ohio	May	5,653	11,551,308	1,330,627	13,950,408	1,205,779	2,911,489	522,667	5,109,283	654,544	10,559,755	75.7	3,390,653	2,587,340	2,284,368	4,091,228
	5 mos.	5,653	57,522,227	6,309,951	68,635,314	6,301,939	15,469,276	2,509,416	26,343,557	3,352,732	54,713,145	79.7	13,922,169	9,793,381	8,445,346	14,029,178
Baltimore & Ohio Chic. Term.	May	85	.....	.....	271,517	24,721	30,382	2,046	136,852	16,900	216,568	79.8	54,949	4,205	69,870	112,512
	5 mos.	85	.....	.....	1,309,172	162,321	160,523	11,403	701,792	93,016	1,158,456	88.5	150,716	—75,824	389,925	442,549
Staten Island Rapid Transit	May	23	56,931	120,384	188,151	25,619	12,447	2,010	89,539	16,033	145,648	77.4	42,503	25,003	9,268	25,183
	5 mos.	23	279,732	548,638	870,539	66,121	66,134	10,088	401,164	79,433	682,940	78.5	187,599	99,599	31,976	95,938
Bangor & Aroostook	May	619	528,531	20,097	576,412	118,365	113,555	6,664	135,245	28,452	404,264	70.1	172,148	118,243	133,367	282,439
	5 mos.	619	3,518,022	233,107	3,885,614	616,697	603,632	28,912	853,803	141,600	2,254,507	58.0	1,631,107	1,291,175	1,245,744	1,629,552
Belt Ry. Co. of Chicago	May	53	.....	.....	463,294	27,046	45,664	3,584	204,991	12,038	293,323	63.3	169,971	92,071	128,846	156,067
	5 mos.	53	.....	.....	2,278,799	134,511	211,799	17,956	1,088,160	51,275	1,503,701	66.0	775,098	448,414	624,606	758,064
Bessemer & Lake Erie	May	227	816,731	2,210	831,548	172,486	188,701	12,752	206,911	35,528	618,906	74.4	212,642	186,448	173,852	659,747
	5 mos.	227	2,700,423	14,085	2,778,528	543,523	1,348,606	71,605	1,005,054	183,124	3,157,446	113.6	—378,918	—517,138	—528,323	626,373
Boston & Maine	May	2,089	3,453,074	879,252	5,058,881	822,288	729,547	85,737	1,788,783	211,947	3,656,531	72.2	1,402,350	1,118,810	912,938	1,021,912
	5 mos.	2,089	16,768,794	4,889,060	25,146,528	3,843,559	3,536,447	414,983	9,429,411	1,127,220	18,448,552	73.4	6,697,976	5,410,351	4,267,078	4,746,135
Brooklyn Eastern Dist. Term.	May	11	104,640	.....	106,820	9,058	12,466	87	34,027	5,708	61,346	57.4	45,474	38,320	38,320	42,278
	5 mos.	11	514,170	.....	521,897	50,070	53,758	3,402	164,007	29,049	300,286	57.5	221,611	187,281	187,281	199,420
Buffalo & Susquehanna	May	253	128,126	387	143,371	23,428	31,470	2,049	39,689	7,084	103,720	72.3	39,651	37,551	45,398	36,955
	5 mos.	253	600,771	2,276	671,529	126,203	177,762	10,751	202,673	35,561	552,950	82.3	118,579	108,079	151,433	150,248
Buffalo, Rochester & Pittsburgh	May	601	981,725	30,899	1,050,546	135,457	282,458	25,346	413,375	38,748	895,994	85.3	154,552	134,396	126,809	194,466
	5 mos.	601	4,861,457	186,390	5,230,462	627,517	1,461,860	144,644	2,186,870	202,261	4,632,155	88.6	598,307	497,733	528,555	873,891
Burlington-Rock Island	May	367	98,954	2,789	107,027	21,403	15,269	6,429	65,298	10,192	118,094	110.3	—11,067	—19,012	—45,082	—157,312
	5 mos.	367	493,649	12,681	537,413	134,671	85,512	32,646	278,371	52,811	581,377	108.2	—43,964	—83,754	—216,071	—647,908
Canadian Pac. Lines in Maine	May	233	111,012	15,230	139,517	86,339	32,562	7,812	71,421	3,410	201,544	144.4	—62,027	—74,027	—92,520	—81,667
	5 mos.	233	968,039	107,942	1,142,135	183,736	255,551	39,587	492,026	21,148	992,048	86.8	150,087	90,087	—14,986	46,683
Canadian Pac. Lines in Vermont	May	85	94,204	14,904	131,399	36,744	27,943	2,466	80,550	2,184	149,887	114.1	—18,488	—22,508	—49,395	—80,368
	5 mos.	85	379,672	100,132	584,518	93,086	147,524	11,026	395,401	13,946	660,915	113.1	—76,397	—96,497	—231,602	—204,862
Central of Georgia	May	1,944	1,073,321	157,163	1,391,421	184,694	294,474	60,427	619,181	80,414	1,245,873	89.5	145,546	26,763	15,842	226,478
	5 mos.	1,944	5,867,778	928,146	7,689,773	677,457	1,350,744	328,750	3,242,235	394,598	6,052,923	78.7	1,636,850	1,049,635	997,841	1,519,865
Central New Jersey	May	692	2,739,807	579,727	3,561,099	377,884	771,256	60,072	1,391,510	107,603	2,730,007	76.7	831,092	453,122	366,106	640,371
	5 mos.	692	13,388,619	2,692,876	17,181,152	1,572,065	3,527,479	284,363	7,060,912	577,486	13,184,226	76.7	3,996,926	2,604,580	2,132,947	2,615,301
Central Vermont	May	456	526,477	54,698	641,795	239,996	100,715	17,982	242,522	25,104	628,029	97.9	13,766	719	7,909	93,917
	5 mos.	456	2,299,485	351,591	2,914,334	535,533	541,375	86,821	1,249,082	125,204	2,547,470	87.4	366,864	296,410	358,624	492,349
Chesapeake & Ohio	May	3,119	9,492,516	388,124	10,392,703	1,182,873	1,928,669	177,924	2,529,678	346,046	6,170,488	59.4	4,222,215	3,355,093	3,283,918	3,836,319
	5 mos.	3,119	44,297,668	1,829,516	48,514,001	6,745,541	9,693,997	829,049	12,808,730	1,721,109	31,899,285	65.8	16,614,716	12,274,928	12,362,622	15,032,613
Chicago & Alton	May	1,028	1,219,141	281,266	1,687,863	195,311	277,316	66,156	653,284	58,136	1,266,634	75.0	421,229	303,624	167,024	—73,411
	5 mos.	1,028	5,853,539	1,446,040	8,157,627	827,639	1,685,814	350,953	3,334,159	312,799	6,604,089	81.0	1,553,538	974,937	205,205	164,114
Chicago & Eastern Illinois	May	938	953,341	155,855	1,238,137	159,731	266,350	70,409	565,988	66,398	1,141,843	92.2	96,294	—19,483	—168,010	3,191
	5 mos.	938	5,168,411	812,106	6,586,810	863,398	1,449,402	358,007	3,007,552	345,467	6,094,803	92.5	492,007	—94,914	—784,944	—235,015
Chicago & Illinois Midland	May	131	197,955	2,688	209,431	21,301	52,930	19,297	72,296	20,450	186,185	88.9	23,246	14,379	10,224	26,954
	5 mos.	131	1,092,799	15,211	1,143,842	121,820	282,727	99,583	366,794	100,456	971,163	84.9	172,679	138,484	98,738	162,856

Mr. MacDonald's testimony is to be believed, for the 8,000 lb. average truck weight used by Mr. Farrin, no increase in cost would be necessary.

In regard to the matter of damage to the roadway through the use of the heavy vehicles, based on Older's formula (now almost entirely discredited by practical design), the conclusion that an 8,000 lb. axle load damages the highway twice as much as a 4,000 lb. axle load, disregards entirely the fact that, with balloon tires on dual wheels, the weight per square inch of tire contact is not increased by the heavy vehicle. It is simply spread over a larger surface. There is a strong possibility that, with a correctly designed pavement, the stress imposed by commercial vehicles is no more severe than the more highly concentrated passenger automobile wheel loads.

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NEWS

Five Months' Net 2.10 Per Cent

Class I railroads of the United States for the first five months of 1931 had a net railway operating income of $188,387,587, which was at the annual rate of return of 2.10 per cent on their property investment, according to reports compiled by the Bureau of Railway Economics. In the first five months of 1930, their net was $308,216,627, or 3.51 per cent. Operating revenues for the five months totaled $1,817,627,035, compared with $2,247,304,488 for the same period in 1930, or a decrease of 19.1 per cent; operating expenses $1,436,628,824, compared with $1,739,226,923, or a decrease of 17.4 per cent.

Class I railroads in the first five months of 1931 paid $137,246,366 in taxes, compared with $149,194,861 for the same period in 1930, a decrease of 8 per cent. For May alone, the tax bill amounted to $27,965,471, a decrease of $3,048,910 under May the previous year.

Forty-four of the 171 Class I railroads operated at a loss in the first five months of 1931 of which 14 were in the Eastern district, 6 in the Southern and 24 in the Western district.

For May alone the roads had a net of $41,263,621, which, for that month, was at the annual rate of return of 2.03 per cent. In May, 1930, their net was $69,322,585 or 3.48 per cent. Operating revenues for May amounted to $369,020,101, compared with $463,263,581 in May, 1930, a decrease of 20.3 per cent. Operating expenses totaled $288,067,333, compared with $351,942,282 in the same month in 1930, a decrease of 18.1 per cent.

The Eastern district reports for the five months a net of $109,636,968, (2.44 per cent) while for the same period in 1930, it was $181,526,429, or 4.15 per cent. Operating revenues were $918,745,151, a decrease of 19.5 per cent; and operating expenses $717,921,919, a decrease of 16.9 per cent. The Eastern district for the month of May had a net of $24,152,920, compared with $44,277,978 in May, 1930.

The Southern district for the first five months reported net of $22,291,061, (1.57 per cent), compared with $39,075,621 last year (2.76 per cent). Operating revenues in the Southern district for five months amounted to $238,652,535, a decrease of 18.5 per cent; operating expenses $192,146,646, a decrease of 16.3 per cent. For May the net was $4,391,074, compared with $6,064,792 in May, 1930.

The Western district reported for five months a net of $56,459,558, (1.86 per cent); for the same five months in 1930 it was $87,614,577 (2.92 per cent). Operating revenues for five months were $660,229,349, a decrease of 18.9 per cent; operating expenses, $526,560,259, a decrease of 18.4 per cent. For May the net in the Western district amounted to $12,719,627. The net of the same roads in May, 1930, totaled $18,979,815.

Federal Highway Aid Increases; State Contributions Reduced

Federal aid for highway construction in 1931 amounts to $259,897,000, as compared with $105,648,000 for 1930, an increase of $154,249,000 while the total state contributions to the roadbuilding program show a reduction of $139,000,000, according to a statement made public at the White House after a canvass made by the Bureau of Roads, at the President's request, with a view to determining the volume of work to be done in the current calendar year.

Western Roads to Appeal Grain Rate Injunction Decision

Presidents of the western railroads, at a meeting of the Association of Western Railways at Chicago on July 2, decided to appeal to the United States supreme court from the decision of the federal district court at Chicago dissolving the order restraining the Interstate Commerce Commission from placing in effect reduced rates on grain and grain products and denying the application for a temporary injunction against the commission's order. The carriers will ask the commission for a postponement of the effective date of the rate order, pending litigation before the supreme court.

Lake Cargo Coal Rate Case Argued

The old controversy over the relative adjustment of lake cargo coal rates from the southern and northern districts to Lake Erie ports is again before the Interstate Commerce Commission for decision following oral argument on July 2 and 3 on the complaint filed by the Pennsylvania and Ohio coal operators who are seeking a reduction in their own rates to widen the differential under the rates from Virginia, West Virginia, Kentucky and Tennessee mines. The northern rates are now 35 cents a ton under those from the South, as the result of a compromise adjustment made effective on January 1, 1929, after the commission had sought to establish a 45-cent differential and the southern lines had reduced their rates to make a 25-cent difference. Examiner C. M. Bardwell, in a proposed report submitted recently recommended that the commission find the present rates to be reasonable and non-discriminatory; and the railways have sought to maintain the present relation.

Transport Policy Howling Farce, Shipper Wires Hoover

J. H. Johnston, traffic manager of the Oklahoma Cottonseed Crushers' Association, is finding some difficulty in locating a place to "co-ordinate" the fact that the railroads of the country are asking the Interstate Commerce Commission for a general advance in freight rates, largely because they have lost traffic, while the War Department is still making waterways to "relieve" the railways of more traffic and to enable certain traffic to be carried at reduced rates. In a telegram addressed to President Hoover he said that if the application of the carriers for increased freight rates is to be taken seriously and "not as an outstanding argument against government competition in operating inland waterways and contributing federal funds to build highways for almost free use by competing trucks," then "we want to earnestly and vigorously protest such increase as being the most absurd proposition ever suggested by the carriers in their own behalf and the most unjust to the interior shippers whose sole dependence is on rail transportation." He added that on June 23 the War Department opened a hearing at Fort Worth, Tex., for the consideration of the canalization of the Little Trinity river "at a huge expense to the government and its citizens for the sole purpose of further reducing freight rates 20 per cent." "What a howling farce—" he said; "taxing all of the people to grant a few a mess of pork in the expenditure of the appropriation and a 20 per cent reduction in freight rates and then saddle not only the cost of the so-called improvement but also the resulting railroad earnings' deficit on the backs of the already overburdened inland shippers by the addition of a 15 per cent increase."

To this the President replied: "The President of the United States has no authority or right to intervene or make suggestions to the Interstate Commerce Commission in question of rates. That commission was expressly set up as an agency independent of administrative control as are the courts. For this reason I recommend that you take the matter up directly with the commission."

Mr. Johnson replied saying he had addressed the President "in an effort to call your attention to the appalling inconsistency of our national transportation policies," and that he considered it of sufficient importance to justify the President making some recommendations to Congress in regard to these inconsistencies; also because the War Department is under the President's immediate supervision and he can "perhaps have

some influence in regard to recommendations for the further expenditure of public funds for transportation purposes." "If my wire protest was not correctly lodged with the head of our government," he said, "I am at a loss to know where I could place it with any hope of obtaining practical results."

Buchanan Branch Open

The new branch of the Norfolk & Western from Devon, W. Va., to Grundy, Va., 39 miles, has been completed and was opened for traffic on July 1. There is one passenger train each way daily except Sunday.

I.C. Land Yields Gas Well

A gas well, yielding about 40,000,000 cu. ft. of dry gas per day, has been brought in on land owned by the Illinois Central at Jackson, Miss. This well represents the first brought in on Illinois Central property, although development of the area at Jackson as a gas field has been under way for about 18 months.

Northern Pacific Installs L.C.L. Collection and Delivery Service

Pick-up and delivery service for l.c.l. freight at stations between Seattle, Wash., and Tacoma on the west, and the Yakima Valley from Cle Elum to Kennewick on the east, was established by the Northern Pacific on July 10. The new service is provided through the medium of a subsidiary, the Northern Pacific Transport Company, which has filed tariffs with the Washington Department of Public Works, fixing rates equal to those of its motor truck competitors. The transport company contracts with trucking companies for the pick-up and delivery of freight and with the railway for the intercity movement. Milton Gordon has been appointed manager of the Northern Pacific Transport Company, with headquarters at Seattle.

Proposed Increases in Iron Rates Denied

Increases proposed by the railroads in freight rates on iron and steel articles from points in Alabama, Georgia, Tennessee and Mississipi to destinations in eastern territory have been found not justified in a decision by the Interstate Commerce Commission. The decision is based on the ground that the proposed rates "would do serious violence to a legitimate business long fostered by respondents" and that the southern manufacturers "would have serious if not insurmountable difficulty in competing with the northern manufacturers." The increases were proposed to become effective on November 12, 1929, as a "delayed portion of a general revision of commodity rates" in the South and between southern and official territories which began in 1923, but were suspended and then voluntarily postponed.

The roads had proposed to cancel commodity rates on a special list of iron and steel articles and to leave eighth-class rates under the southern classification to apply. These are 30 per cent of the first-class rates and are on substantially the same level as the rates for application within the South and from the South to central territory. During the hearings the railroads came to the conclusion that the eighth-class rates would be too high, in view of the competitive situation, and proposed to substitute mileage scales as prescribed by the commission for eastern territory, approximately 30 per cent of the first-class eastern rates. The commission, however, declined to approve the substitute basis, on the existing record, because all interests had not been consulted.

Railroad Oil Lands in Receivership

An order placing oil properties of the Missouri-Kansas-Texas and the St. Louis-San Francisco in temporary receivership has been issued by the United States district court at Oklahoma City, Okla. Albert C. Hunt, former associate justice of the Oklahoma supreme court, has been appointed temporary receiver. A hearing on an application to make the receivership permanent was held on July 6.

The suits were filed at the instance of W. H. Murray, governor of Oklahoma, and seek to reclaim for the state 88 acres of Katy land on which there are six producing oil wells, and 42 acres of Frisco land on which there are three producing wells. The state contends that the two railroads have violated a section of the state constitution which forbids public service corporations from owning or holding land for longer than seven years unless necessary for the conduct of their business. It also prohibits corporations from owning real estate for any other purpose than that for which they were chartered.

Complains of Road Hog Trucks

To the New York Herald Tribune:

Probably the most dangerous menace the traveling public in motor vehicles have to contend with is the colossal trucks of all descriptions which are abusing the highways. These trucks are getting broader, higher, longer and bigger and fairly scream defiance of authority. They travel at a speed just a little lower than a private vehicle and in many cases the drivers are indifferent to the rights of others; especially on wet days many refuse to give the vehicle going the same way and wishing to pass the same amount of the road as the oncoming car. One heavy truck will damage a highway more than a thousand passenger cars, and the money received in taxes and registrations, as compared to passenger cars, is negligible.

I would suggest that every motorist take the number of every objectionable truck and enter a complaint to the Commissioners of Vehicles of all the states on whose highways these trucks operate. The railroads own their roadbeds, maintain them and pay a large tax toward the support of the states and the nation, while these road hogs blatantly continue to endanger the lives of the traveling public at the public's expense.

LEON P. BROWN.

NIANTIC, CONN.

New Passenger Service on National of Mexico

The National of Mexico on July 1 added first and second class coach and mail and express service to four fast freight trains operating daily between Monterrey, N. L., and Tampico, Tam. These trains, two in each direction, already had each a Pullman sleeper.

Soo Line Sells Grain Elevator

The Minneapolis, St. Paul & Sault Ste. Marie has sold its 2,250,000-bu. grain elevator at its Humboldt Avenue yard, Minneapolis, Minn., to the Farmers' National Grain Corporation, a marketing subsidiary of the Federal Farm Board. This elevator has been under lease to the Bartlett-Frazier Company.

Illinois Terminal Opens New Line

The new double-track elevated line of the Illinois Terminal System, connecting the McKinley bridge with the surface section of the elevated-surface-subway and terminal improvements of the company at St. Louis, Mo., was placed in service on July 4. The subway section of the improvements is still under construction and when completed will connect with a new underground freight and passenger terminal at Twelfth street and Lucas avenue. Including the new freight terminal and warehouse building and the remodeling of a building as a passenger terminal and office building the total cost of the improvement will be about $16,000,000.

State Commissioners Selected to Co-Operate With I.C.C. in Rate Case

At a meeting of representatives of eastern state railroad and utilities commissioners in Washington on July 7, W. D. B. Ainey, chairman of the Pennsylvania Public Service Commission, and H. W. Trafton, of the Maine Public Utilities Commission, were selected as members of the committee of state commissioners to cooperate with the Interstate Commerce Commission by sitting with its members during the hearings on the railroad application for an increase in freight rates and by participating with it in its deliberations, but not its decision. At a meeting in Atlanta of representatives of southern commissions Harvey H. Hannah, of the Tennessee Railroad Commission, and Hugh White, of the Alabama Public Service Commission, were similarly chosen. Other meetings were held at Kansas City for the western district and at Salt Lake City for the Mountain-Pacific district.

W. R. Cole, president of the Louisville & Nashville, has furnished the Interstate Commerce Commission with a copy of a letter addressed to J. H. Henderson, com-

(*Continued on page 70*)

Revenues and Expenses of Railways

MONTH OF MAY AND FIVE MONTHS OF CALENDAR YEAR 1931

Name of road		Av. mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	General	Total	Operating ratio.	Net from railway operation.	Operating income (or loss).	Net ry. operating income.	Net ry. operating income, 1930.
Akron, Canton & Youngstown	May	171	$171,752	$64	$180,585	$24,360	$17,383	$12,371	$50,502	$17,510	$122,126	67.6	$58,459	$45,107	$31,206	$47,652
	5 mos.	171	825,415	382	867,146	102,618	85,344	63,767	264,245	75,292	590,793	68.1	276,353	213,616	141,682	229,391
Alton & Southern	May	30	104,185	.....	106,023	10,359	7,325	5,592	35,205	4,370	62,851	59.28	43,172	32,671	30,904	24,204
	5 mos.	30	448,156	.....	452,897	48,447	33,130	25,431	170,488	23,406	300,932	66.45	151,965	106,331	99,987	113,151
Atchison, Topeka & Santa Fe	May	9,670	8,809,709	1,895,137	11,888,330	2,241,996	2,793,379	409,851	4,128,769	443,013	10,001,208	84.1	1,887,142	885,309	879,733	1,217,911
	5 mos.	9,653	44,819,453	9,343,502	60,142,840	9,128,694	14,289,940	2,041,643	20,494,056	2,198,349	48,113,552	80.0	12,029,288	6,897,365	6,841,449	7,974,321
Gulf, Colorado & Santa Fe	May	1,976	1,245,830	79,549	1,441,611	277,818	389,744	58,046	548,133	69,841	1,335,149	92.6	106,462	8,592	—109,419	—132,203
	5 mos.	1,976	5,853,264	436,943	6,793,416	1,370,409	1,772,260	290,220	2,678,693	396,652	6,494,269	95.6	299,147	—189,247	—736,930	—770,644
Panhandle & Santa Fe	May	1,877	708,721	58,217	838,552	111,256	215,880	19,878	299,378	38,461	684,674	81.6	153,878	101,241	—10,949	—213,812
	5 mos.	1,754	3,524,632	319,891	4,184,587	886,893	1,075,388	103,857	1,499,441	193,837	3,740,092	89.4	444,495	163,705	—354,922	—550,130
Atlanta & West Point	May	93	99,023	29,733	151,454	26,741	33,195	9,429	65,985	11,453	150,852	99.6	602	—11,024	—24,389	—14,564
	5 mos.	93	543,695	150,385	813,733	109,891	159,537	52,712	339,454	58,860	738,714	90.8	75,019	16,664	—31,317	42,482
Western of Alabama	May	133	107,363	32,694	157,793	24,416	41,337	10,251	60,402	12,078	151,625	96.1	6,168	—4,121	3,477	11,628
	5 mos.	133	612,451	160,530	869,667	131,683	199,449	56,144	318,134	60,939	783,257	90.1	86,410	25,928	62,219	154,230
Atlanta, Birmingham & Coast	May	639	236,985	10,690	281,317	73,012	76,763	25,913	142,832	20,358	347,709	123.6	—66,392	—82,364	—96,749	—85,895
	5 mos.	639	1,281,956	52,583	1,500,119	369,966	371,142	134,749	717,255	98,109	1,738,640	115.9	—238,521	—318,511	—421,038	—331,571
Atlantic Coast Line	May	5,162	4,376,223	540,847	5,355,569	708,095	916,745	130,687	1,831,825	174,243	3,791,595	70.8	1,563,974	1,063,420	848,730	421,590
	5 mos.	5,162	22,111,832	4,969,123	29,799,100	3,634,570	4,850,881	759,941	9,645,628	884,252	20,089,294	67.4	9,709,806	6,958,012	5,734,344	5,741,173
Charleston & Western Carolina	May	342	199,567	5,747	212,526	30,402	26,751	6,474	79,988	6,453	149,975	70.6	62,551	42,573	33,662	7,421
	5 mos.	342	1,056,409	24,723	1,120,547	175,618	153,511	36,689	418,513	31,981	815,787	72.8	304,760	204,759	177,278	76,503
Baltimore & Ohio	May	5,653	11,551,308	1,330,627	13,950,408	1,205,779	2,911,489	522,667	5,109,283	654,544	10,559,755	75.7	3,390,653	2,587,340	2,284,368	4,091,228
	5 mos.	5,653	57,522,227	6,309,951	68,635,314	6,301,939	15,469,276	2,509,416	26,343,557	3,352,732	54,713,145	79.7	13,922,169	9,793,381	8,445,346	14,029,178
Baltimore & Ohio Chic. Term.	May	85	.....	.....	271,517	24,721	30,382	2,046	136,852	16,900	216,568	79.8	54,949	4,205	69,870	112,512
	5 mos.	85	.....	.....	1,309,172	162,321	160,523	11,403	701,792	93,016	1,158,456	88.5	150,716	—75,824	389,925	442,549
Staten Island Rapid Transit	May	23	56,931	120,384	188,151	25,619	12,447	2,010	89,539	16,033	145,648	77.4	42,503	25,003	9,268	25,183
	5 mos.	23	279,732	548,638	870,539	66,121	66,134	10,088	401,164	79,433	682,940	78.5	187,599	99,599	31,976	95,938
Bangor & Aroostook	May	619	528,531	20,097	576,412	118,365	113,555	6,664	135,245	28,452	404,264	70.1	172,148	118,243	133,367	282,439
	5 mos.	619	3,518,022	233,107	3,885,614	616,697	603,632	28,912	853,803	141,600	2,254,507	58.0	1,631,107	1,291,175	1,245,744	1,629,552
Belt Ry. Co. of Chicago	May	53	.....	.....	463,294	27,046	45,664	3,584	204,991	12,038	293,323	63.3	169,971	92,071	128,846	156,067
	5 mos.	53	.....	.....	2,278,799	134,511	211,799	17,956	1,088,160	51,275	1,503,701	66.0	775,098	448,414	624,606	758,064
Bessemer & Lake Erie	May	227	816,731	2,210	831,548	172,486	188,701	12,752	206,911	35,528	618,906	74.4	212,642	186,448	173,852	659,747
	5 mos.	227	2,700,423	14,085	2,778,528	543,523	1,348,606	71,605	1,005,054	183,124	3,157,446	113.6	—378,918	—517,138	—528,323	626,373
Boston & Maine	May	2,089	3,453,074	879,252	5,058,881	822,288	729,547	85,737	1,788,783	211,947	3,656,531	72.2	1,402,350	1,118,810	912,938	1,021,912
	5 mos.	2,089	16,768,794	4,889,060	25,146,528	3,843,559	3,536,447	414,983	9,429,411	1,127,220	18,448,552	73.4	6,697,976	5,410,351	4,267,078	4,746,135
Brooklyn Eastern Dist. Term.	May	11	104,640	.....	106,820	9,058	12,466	87	34,027	5,708	61,346	57.4	45,474	38,320	38,320	42,278
	5 mos.	11	514,170	.....	521,897	50,070	53,758	3,402	164,007	29,049	300,286	57.5	221,611	187,281	187,281	199,420
Buffalo & Susquehanna	May	253	128,126	387	143,371	23,428	31,470	2,049	39,689	7,084	103,720	72.3	30,651	37,551	45,398	36,955
	5 mos.	253	600,771	2,276	671,529	126,203	177,762	10,751	202,673	35,561	552,950	82.3	118,579	108,079	151,433	150,248
Buffalo, Rochester & Pittsburgh	May	601	981,725	30,899	1,050,546	135,457	282,458	25,346	413,375	38,748	895,994	85.3	154,552	134,396	126,809	194,466
	5 mos.	601	4,861,457	186,390	5,230,462	627,517	1,461,860	144,644	2,186,870	202,261	4,632,155	88.6	598,307	497,733	528,555	873,891
Burlington-Rock Island	May	367	98,954	2,789	107,027	21,403	15,269	6,429	65,298	10,192	118,094	110.3	—11,067	—19,012	—45,082	—157,312
	5 mos.	367	493,649	12,681	537,413	134,671	85,512	32,646	278,371	52,811	581,377	108.2	—43,964	—83,754	—216,071	—647,908
Canadian Pac. Lines in Maine	May	233	111,012	15,230	139,517	86,339	32,562	7,812	71,421	3,410	201,544	144.4	—62,027	—74,027	—92,520	—81,667
	5 mos.	233	968,039	107,942	1,142,135	183,736	255,551	39,587	492,026	21,148	992,048	86.8	150,087	90,087	—14,986	46,683
Canadian Pac. Lines in Vermont	May	85	94,204	14,904	131,399	36,744	27,943	2,466	80,550	2,184	149,887	114.1	—18,488	—22,508	—49,395	—80,368
	5 mos.	85	379,672	100,132	584,518	93,086	147,524	11,026	395,401	13,946	660,915	113.1	—76,397	—96,497	—231,602	—204,862
Central of Georgia	May	1,944	1,073,321	157,163	1,391,421	184,694	294,474	60,427	619,181	80,414	1,245,873	89.5	145,546	26,763	15,842	226,478
	5 mos.	1,944	5,867,778	928,146	7,689,773	677,457	1,350,744	328,750	3,242,235	394,598	6,052,923	78.7	1,636,850	1,049,635	997,841	1,519,865
Central New Jersey	May	692	2,739,807	579,727	3,561,099	377,884	771,256	60,072	1,391,510	107,603	2,730,007	76.7	831,092	453,122	366,106	640,371
	5 mos.	692	13,388,619	2,692,876	17,181,152	1,572,065	3,577,479	284,363	7,060,912	577,486	13,184,226	76.7	3,996,926	2,604,580	2,132,947	2,615,301
Central Vermont	May	456	526,477	54,698	641,795	239,996	100,715	17,982	242,522	25,104	628,029	97.9	13,766	719	7,909	93,917
	5 mos.	456	2,299,485	351,591	2,914,334	535,533	541,375	86,821	1,249,082	125,204	2,547,470	87.4	366,864	296,410	358,624	492,349
Chesapeake & Ohio	May	3,119	9,492,516	388,124	10,392,703	1,182,873	1,928,669	177,924	2,529,678	346,046	6,170,488	59.4	4,222,215	3,355,093	3,283,918	3,836,319
	5 mos.	3,119	44,297,668	1,829,516	48,514,001	6,745,541	9,693,997	829,049	12,808,730	1,721,109	31,899,285	65.8	16,614,716	12,274,928	12,362,622	15,032,613
Chicago & Alton	May	1,028	1,219,141	281,266	1,687,863	195,311	277,316	66,156	653,284	58,136	1,266,634	75.0	421,229	303,624	167,024	—73,411
	5 mos.	1,028	5,853,539	1,446,040	8,157,627	827,639	1,685,814	350,953	3,334,159	312,799	6,604,089	81.0	1,553,538	974,937	205,205	164,114
Chicago & Eastern Illinois	May	938	953,341	155,855	1,238,137	159,731	266,350	70,409	565,988	66,398	1,141,843	92.2	96,294	—19,483	—168,010	3,191
	5 mos.	938	5,168,411	812,106	6,586,810	863,398	1,449,402	358,007	3,007,552	345,467	6,094,803	92.5	492,007	—94,914	—784,944	—235,015
Chicago & Illinois Midland	May	131	197,955	2,688	209,431	21,301	52,930	19,297	72,296	20,450	186,185	88.9	23,246	14,379	10,224	26,954
	5 mos.	131	1,092,799	15,211	1,143,842	121,820	282,727	99,583	366,794	100,456	971,163	84.9	172,679	138,484	98,738	162,856

Revenues and Expenses of Railways

MONTH OF MAY AND FIVE MONTHS OF CALENDAR YEAR 1931—CONTINUED

Name of road		Av. mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of— Way and structures.	Equipment.	Traffic.	Transportation.	General.	Total.	Operating ratio.	Net from railway operation.	Operating income (or loss).	Net ry. operating income.	Net ry. operating income, 1930.
Chicago & North Western	May	8,458	$6,778,654	$1,305,033	$9,128,355	$1,716,388	$1,866,081	$220,264	$3,608,602	$376,367	$7,835,985	85.8	$1,292,370	$567,459	$279,316	$1,446,649
	5 mos.	8,458	31,970,064	6,150,261	42,982,580	6,235,279	8,736,520	970,459	18,050,655	1,898,338	36,132,748	84.1	6,849,832	3,222,057	2,123,087	4,433,977
Chicago, Burlington & Quincy	May	9,319	7,290,023	931,285	9,270,321	1,453,346	1,485,444	290,715	3,210,016	349,104	6,839,787	73.8	2,430,534	1,608,906	1,385,551	1,097,562
	5 mos.	9,320	38,115,170	4,543,041	47,779,286	5,579,760	7,711,252	1,256,595	16,544,010	1,790,853	33,208,541	69.5	14,570,745	10,203,648	8,890,370	10,934,417
Chicago Great Western	May	1,495	1,409,923	106,597	1,637,889	246,855	190,330	79,527	613,562	56,982	1,190,903	72.7	446,986	363,877	175,688	152,514
	5 mos.	1,495	6,972,240	554,312	8,113,403	904,454	943,633	408,667	3,129,562	294,300	5,702,231	70.3	2,411,172	1,985,258	1,045,092	854,362
Chicago, Indianapolis & Louisville	May	647	771,537	116,813	991,823	100,581	186,354	36,537	389,420	31,842	757,734	76.4	234,089	168,420	53,957	129,819
	5 mos.	647	3,893,101	517,761	4,906,061	461,884	1,030,862	175,761	1,991,341	172,510	3,881,968	79.1	1,024,099	708,577	152,356	462,320
Chicago, Mil., St. Paul & Pacific	May	11,323	7,801,495	725,367	9,481,831	2,309,862	1,961,992	271,201	3,657,975	337,592	8,542,818	90.1	939,013	173,033	—195,203	735,416
	5 mos.	11,322	38,231,533	3,712,487	46,704,409	7,117,858	10,172,419	1,408,800	18,793,096	1,721,987	39,246,451	84.0	7,457,958	3,555,018	1,635,663	4,375,718
Chicago River & Indiana	May	20	.....	.....	462,013	38,000	35,000	1,953	157,131	22,243	254,327	55.0	207,686	154,690	227,854	259,566
	5 mos.	20	.....	.....	2,341,433	218,000	195,000	9,565	801,247	95,054	1,318,866	56.3	1,022,567	811,356	1,176,229	1,242,741
Chicago, Rock Island & Pacific	May	7,593	6,374,279	855,234	8,029,779	947,726	1,437,786	236,861	3,073,206	338,134	6,127,409	76.3	1,902,370	1,372,309	970,133	1,054,988
	5 mos.	7,593	31,138,014	4,535,315	39,628,963	4,321,571	7,288,468	1,179,332	15,619,518	1,711,843	30,604,767	77.2	9,024,196	6,306,085	4,343,562	5,493,731
Chicago, Rock Island & Gulf	May	625	324,649	40,695	404,114	54,789	38,259	20,929	152,848	35,255	305,840	75.7	98,274	76,640	43,412	74,074
	5 mos.	625	1,835,380	230,049	2,253,327	309,045	199,684	102,020	769,444	112,483	1,508,470	66.9	744,857	623,136	480,013	465,708
Chic., St. Paul, Minn. & Omaha	May	1,736	1,229,437	195,742	1,574,889	256,000	328,579	40,315	710,770	85,451	1,429,173	90.7	145,716	50,498	—27,275	56,981
	5 mos.	1,736	6,106,696	963,924	7,757,113	1,172,873	1,554,308	197,758	3,640,071	419,558	7,033,613	90.7	723,500	251,963	—99,144	688,115
Clinchfield R. R.	May	309	432,182	6,219	447,663	43,088	112,491	17,429	109,993	17,164	300,043	67.0	147,620	82,620	103,633	146,438
	5 mos.	309	2,325,028	35,716	2,405,035	270,003	591,981	97,100	537,919	87,982	1,584,325	65.9	820,710	495,699	712,605	932,928
Colorado & Southern	May	1,037	466,988	42,218	568,835	102,582	127,959	13,843	224,282	38,308	507,650	89.2	61,185	—6,516	—27,381	55,918
	5 mos.	1,037	2,671,173	234,842	3,222,256	440,235	728,724	75,310	1,242,197	200,280	2,692,834	83.6	529,422	192,144	97,030	505,369
Ft. Worth & Denver City	May	696	387,075	67,062	500,219	71,928	92,259	19,321	173,676	37,237	395,182	79.0	105,037	72,619	58,022	66,109
	5 mos.	696	2,157,224	341,766	2,719,892	327,887	489,161	96,554	940,288	187,258	2,052,106	75.4	667,786	491,917	421,434	588,654
Wichita Valley	May	270	34,508	1,126	39,335	14,877	3,175	35	22,257	1,655	41,958	106.7	—2,623	—9,391	—18,407	—21,708
	5 mos.	270	200,633	6,928	222,881	65,994	19,067	66	115,425	8,572	208,808	93.7	14,073	—20,888	—72,071	—60,199
Columbus & Greenville	May	167	82,844	7,062	95,596	16,565	13,221	3,279	34,884	13,629	81,578	85.3	14,018	10,988	12,518	2,266
	5 mos.	167	393,198	32,657	452,034	71,389	65,428	19,070	180,725	58,456	395,054	87.4	56,980	45,788	50,412	80,686
Conemaugh & Black Lick	May	20	30,989	.....	55,351	6,670	17,807	484	38,493	3,422	66,776	120.6	—11,425	—12,325	—9,041	38,569
	5 mos.	20	153,103	.....	332,427	48,034	97,329	2,747	236,861	17,421	402,392	121.0	—69,965	—74,465	—58,919	80,674
Delaware & Hudson	May	882	2,301,464	146,452	2,650,742	352,061	642,169	58,851	1,005,557	152,733	2,218,282	83.7	432,460	355,456	359,380	537,637
	5 mos.	882	11,511,057	813,446	13,186,290	2,100,030	3,357,930	279,373	5,110,112	770,916	11,649,313	88.3	1,536,977	1,081,336	1,157,094	1,937,860
Delaware, Lackawanna & Western	May	998	3,801,991	723,699	5,244,567	632,435	1,001,644	143,901	2,124,708	172,543	4,114,322	78.4	1,130,245	660,106	635,246	1,109,336
	5 mos.	998	18,581,057	3,601,961	25,549,533	2,429,726	4,840,620	682,042	10,963,743	879,839	19,996,111	78.3	5,553,422	3,285,350	3,223,179	4,052,040
Denver & Rio Grande Western	May	2,536	1,592,810	115,694	1,855,097	249,616	424,214	55,346	584,752	85,274	1,410,298	76.0	444,799	279,714	270,681	516,894
	5 mos.	2,554	8,131,254	601,784	9,389,886	1,128,288	2,195,428	273,363	2,999,550	435,146	7,101,217	75.6	2,288,669	1,462,454	1,561,008	2,190,963
Denver & Salt Lake	May	232	150,733	8,533	172,401	32,059	34,945	1,805	29,337	10,964	109,110	63.3	63,291	47,291	52,431	27,668
	5 mos.	232	668,518	44,820	779,068	144,612	186,524	9,423	153,874	54,486	548,919	61.7	230,149	150,137	189,697	326,279
Detroit & Mackinac	May	242	102,007	3,538	113,896	27,745	26,146	1,500	29,395	4,517	88,803	78.0	25,093	39,351	39,274	28,023
	5 mos.	242	335,949	23,427	401,571	79,656	75,790	7,007	136,261	21,248	309,828	77.2	91,743	71,653	67,382	—1,690
Detroit & Toledo Short Line	May	50	270,785	.....	275,262	41,218	27,884	7,693	77,711	7,973	160,870	58.4	114,392	882,208	38,015	58,473
	5 mos.	50	1,392,953	.....	1,413,260	147,350	139,129	38,243	387,247	39,762	750,083	53.1	663,177	538,837	267,576	466,125
Detroit Terminal	May	19	.....	.....	93,257	9,508	9,114	.....	48,765	3,955	71,342	76.5	21,915	9,021	1,857	21,276
	5 mos.	19	.....	.....	476,098	44,145	47,235	6	248,625	20,359	360,370	75.7	115,728	48,594	10,916	105,938
Detroit, Toledo & Ironton	May	487	526,851	1,181	544,118	66,006	87,810	11,805	185,351	30,355	379,763	69.8	164,355	116,291	108,339	444,268
	5 mos.	494	3,015,475	5,430	3,093,680	371,943	447,081	63,892	971,536	158,204	2,008,575	64.9	1,085,105	842,162	737,349	2,242,076
Duluth, Missabe & Northern	May	564	847,909	3,041	974,938	370,928	284,921	3,525	255,726	37,364	952,464	97.7	22,474	—60,514	—58,798	1,930,187
	5 mos.	564	1,254,812	17,053	1,482,959	1,035,122	1,538,389	21,212	998,717	194,098	3,787,142	255.4	—2,304,183	—2,634,036	—2,635,890	—740,964
Duluth, Winnipeg & Pacific	May	178	75,945	6,061	91,048	34,697	37,593	4,407	50,185	8,350	136,286	149.7	—45,238	—50,462	—36,951	2,468
	5 mos.	178	485,857	30,748	547,107	127,976	177,082	22,543	286,029	36,969	656,483	120.0	—109,376	—137,455	—89,480	33,812
Elgin, Joliet & Eastern	May	447	1,139,847	5	1,261,532	184,670	289,507	15,998	533,976	48,381	1,071,795	85.0	189,737	73,289	6,892	354,450
	5 mos.	447	6,406,199	24	7,029,566	871,545	1,597,343	77,046	2,843,809	264,636	5,653,760	80.4	1,375,806	803,464	403,899	1,551,041
Erie Railroad	May	2,046	5,644,242	650,292	6,920,445	984,900	1,453,442	178,326	2,638,594	279,651	5,571,222	80.5	1,349,223	934,441	865,355	1,124,028
	5 mos.	2,046	28,147,444	3,200,802	34,218,958	3,885,198	7,557,280	819,258	13,257,456	1,416,406	27,087,972	79.2	7,130,986	5,233,010	4,921,760	4,696,547
Chicago & Erie	May	269	834,376	36,460	943,088	132,783	116,264	33,852	279,231	40,457	602,577	63.9	340,511	284,494	37,921	237,238
	5 mos.	269	4,204,103	176,286	4,697,400	540,292	565,541	146,350	1,411,615	209,835	2,871,322	61.1	1,826,078	1,545,819	315,586	786,532

Revenues and Expenses of Railways

MONTH OF MAY AND FIVE MONTHS OF CALENDAR YEAR 1931—CONTINUED

Name of road		Av. mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of—Way and structures.	Equip. ment.	Traffic.	Trans-portation.	General.	Total.	Operating ratio.	Net from railway operation.	Operating income (or loss).	Net ry. operating income.	Net ry. operating income, 1930.
New Jersey & New York	May	45	$25,858	$86,162	$115,714	$12,242	$21,286	$1,393	$57,111	$3,569	$95,601	82.6	$20,113	$15,711	—$14,561	—$17,217
	5 mos.	45	121,307	418,822	557,843	51,201	96,400	6,868	283,988	17,835	456,281	81.8	101,562	79,571	—72,087	—118,691
N. Y. Susquehanna & Western	May	131	355,254	35,558	420,694	50,590	49,616	4,823	150,513	11,856	267,355	63.6	153,339	120,635	94,085	80,277
	5 mos.	131	1,666,473	170,942	1,997,332	187,236	239,139	23,723	775,958	65,273	1,291,282	64.7	706,050	542,183	385,845	213,244
Florida East Coast	May	864	820,886	135,672	1,059,380	110,418	126,942	25,719	284,418	44,441	601,870	56.8	457,510	340,984	283,274	114,690
	5 mos.	864	3,197,194	1,811,609	5,748,308	641,200	823,036	159,762	1,530,480	233,663	3,486,940	60.7	2,261,368	1,677,976	1,363,430	1,887,596
Fort Smith & Western	May	249	53,512	2,928	61,254	13,395	14,825	4,780	28,557	5,435	66,633	108.8	—5,379	—9,000	—19,553	—9,168
	5 mos.	249	301,412	16,881	347,592	65,377	64,792	24,603	151,106	28,423	330,372	95.0	17,220	—851	—46,764	—5,790
Galveston Wharf	May	13	.....	.....	128,443	32,989	5,237	4,750	28,020	15,780	99,384	77.4	29,059	6,059	6,133	—9,309
	5 mos.	13	.....	.....	649,848	73,938	25,181	19,994	131,003	44,727	458,956	70.6	190,892	75,657	75,830	27,226
Georgia R. R.	May	328	288,889	30,083	349,604	37,820	71,139	19,565	159,082	23,049	311,121	89.0	38,483	30,868	43,326	37,592
	5 mos.	328	1,475,328	146,272	1,764,957	187,084	337,864	105,155	802,355	116,566	1,541,737	87.4	223,220	184,805	240,100	273,961
Georgia & Florida	May	463	101,816	2,530	110,003	31,716	20,055	10,599	44,580	7,712	114,707	104.3	—4,704	—12,204	—15,567	—13,375
	5 mos.	463	565,554	17,517	616,439	152,087	107,213	52,986	254,059	38,915	606,008	98.3	10,431	—27,071	—45,252	—25,402
Grand Trunk Western	May	1,021	1,705,627	102,460	1,929,918	415,144	394,813	64,530	843,103	103,959	1,817,041	94.2	112,877	—3,540	—152,570	129,200
	5 mos.	1,019	8,137,988	534,868	9,327,954	1,335,151	1,893,302	330,264	4,092,416	526,544	8,215,793	88.1	1,112,161	516,045	—411,105	1,226,979
Canadian Natl. Lines in New Eng.	May	172	74,791	9,135	97,810	23,763	29,759	5,399	72,637	8,412	142,856	146.1	—45,046	—59,956	—98,018	—61,002
	5 mos.	172	485,071	71,670	634,880	119,364	117,918	27,385	403,607	43,616	789,530	124.4	—154,650	—230,655	—465,172	—397,961
Great Northern	May	8,370	5,093,687	466,676	6,204,049	1,500,798	1,233,736	263,248	2,089,294	230,591	5,371,717	86.6	832,332	158,965	65,440	908,484
	5 mos.	8,370	24,240,331	2,409,270	29,582,017	4,210,738	6,856,393	1,167,023	10,915,776	1,160,178	24,554,991	83.0	5,027,026	1,639,232	993,074	1,582,869
Green Bay & Western	May	234	116,361	1,339	120,595	22,765	21,586	5,340	48,794	3,617	102,087	84.7	18,508	12,508	10,932	37,761
	5 mos.	234	572,897	8,249	596,386	104,758	128,816	28,105	252,104	15,972	529,538	88.8	66,848	26,848	21,049	134,833
Gulf & Ship Island	May	307	92,733	15,952	129,981	32,991	24,495	4,293	73,532	6,531	142,930	110.0	—12,949	—42,965	—56,887	—47,704
	5 mos.	307	545,400	94,888	759,012	203,745	141,268	21,877	399,604	33,991	806,285	106.2	—47,273	—197,343	—263,520	—2,797
Gulf, Mobile & Northern	May	733	340,973	11,640	370,366	57,382	67,083	23,383	139,550	20,818	308,124	83.19	62,242	35,449	6,079	76,187
	5 mos.	733	1,680,187	61,725	1,830,703	290,994	315,038	132,554	677,190	112,858	1,529,448	83.54	301,255	165,260	33,280	254,888
Illinois Central	May	5,018	6,854,356	1,072,084	9,117,491	1,110,580	2,141,483	229,807	3,486,587	375,627	7,399,531	81.2	1,717,960	1,055,220	846,069	1,430,603
	5 mos.	5,018	33,695,841	5,740,484	43,775,777	5,049,033	10,358,003	1,229,154	17,607,135	1,831,244	36,412,089	83.2	7,363,688	4,068,351	3,367,588	7,220,910
Yazoo & Mississippi Valley	May	1,681	1,291,971	127,037	1,536,242	248,788	267,351	40,462	602,484	70,812	1,234,081	80.3	302,161	137,236	7,921	35,140
	5 mos.	1,684	5,935,123	655,738	7,081,126	1,187,396	1,377,971	209,547	3,183,449	339,829	6,314,179	89.2	766,947	—51,593	—696,625	1,087,789
Illinois Central System	May	6,700	8,146,327	1,199,121	10,653,733	1,359,368	2,408,834	270,269	4,089,071	446,439	8,633,612	81.0	2,020,121	1,192,456	853,990	1,457,643
	5 mos.	6,702	39,630,964	6,396,222	50,856,903	6,236,429	11,735,974	1,438,701	20,790,584	2,171,073	42,726,268	84.0	8,130,635	4,016,758	2,670,963	8,313,413
Illinois Terminal	May	559	467,371	91,328	581,953	68,077	70,155	19,633	169,471	34,272	361,538	62.12	220,415	192,415	162,905	150,497
	5 mos.	559	2,133,850	445,847	2,706,306	295,557	356,946	95,259	883,147	189,102	1,815,349	67.08	890,912	738,484	605,532	611,295
Kansas City Southern	May	784	904,127	44,425	1,083,004	123,546	183,833	52,778	340,041	71,262	773,883	71.5	309,121	207,483	168,205	332,943
	5 mos.	784	4,651,632	224,778	5,484,462	492,890	945,066	279,105	1,696,643	349,757	3,750,945	68.4	1,733,517	1,262,829	1,104,494	1,312,024
Texarkana & Ft. Smith	May	99	185,572	3,325	207,054	9,690	13,140	7,731	50,401	9,592	92,554	44.7	114,500	105,868	78,338	38,908
	5 mos.	99	689,329	15,413	793,036	75,651	59,691	37,241	233,758	50,281	467,649	59.0	325,387	282,150	166,922	163,411
Kansas, Oklahoma & Gulf	May	326	216,353	1,273	222,635	27,722	25,174	14,238	51,005	11,464	128,949	57.9	93,686	75,674	55,371	46,590
	5 mos.	326	1,018,216	6,171	1,047,067	119,643	116,715	69,288	260,248	57,360	620,225	59.2	426,842	335,182	243,599	374,739
Lake Superior & Ishpeming	May	160	97,070	259	113,936	25,087	23,718	674	30,956	7,702	88,137	77.4	25,799	9,655	9,566	99,270
	5 mos.	160	282,439	3,167	317,796	106,433	132,538	2,982	146,610	36,512	425,075	133.8	—107,279	—191,982	—201,270	—67,827
Lake Terminal	May	12	.....	.....	49,880	5,021	5,523	.....	27,615	3,365	41,524	83.2	8,356	3,676	3,076	21,850
	5 mos.	12	.....	.....	267,055	51,428	52,032	.....	155,641	9,404	268,505	100.5	—1,450	—24,850	—34,988	—41,667
Lehigh & Hudson River	May	96	170,003	544	179,700	22,005	26,919	3,964	59,929	8,974	121,791	67.8	57,909	43,437	23,787	30,491
	5 mos.	96	810,597	3,679	858,557	98,086	129,547	18,603	305,595	47,057	598,888	69.8	259,669	189,004	102,635	92,536
Lehigh & New England	May	216	368,909	755	373,193	55,547	82,321	5,536	126,245	24,145	293,728	78.7	79,465	67,357	74,220	106,003
	5 mos.	216	1,792,035	4,014	1,812,507	247,138	390,723	26,403	641,561	116,051	1,421,810	78.4	390,697	327,905	380,983	379,290
Lehigh Valley	May	1,361	3,858,943	348,532	4,602,673	459,357	1,045,097	133,786	1,867,462	133,204	3,661,386	79.5	941,287	647,316	544,106	992,196
	5 mos.	1,361	18,963,935	1,788,447	22,552,347	1,987,554	5,218,280	648,942	9,503,761	676,493	18,147,860	80.5	4,404,487	2,946,163	2,416,089	2,916,833
Louisiana & Arkansas	May	608	441,714	14,108	484,127	73,523	72,662	16,436	130,391	23,213	316,203	65.3	167,924	121,885	103,970	83,819
	5 mos.	608	2,026,084	64,729	2,223,781	358,279	307,011	101,794	657,232	115,537	1,541,074	69.3	682,707	451,489	375,225	465,143
Louisiana, Arkansas & Texas	May	202	54,670	1,097	58,397	18,482	8,581	3,671	25,140	4,371	60,230	103.1	—1,833	—5,868	—11,757	—34,737
	5 mos.	202	288,780	5,952	308,373	85,439	42,157	17,683	129,658	23,368	298,223	96.7	10,150	—9,777	—46,207	—120,317
Louisville & Nashville	May	5,264	6,455,366	740,881	7,748,229	1,110,622	1,595,324	202,086	2,886,534	379,595	6,219,740	80.3	1,528,489	1,038,788	1,005,626	1,110,411
	5 mos.	5,268	32,294,880	3,733,357	38,870,415	5,750,422	8,635,328	1,193,747	14,646,016	1,937,797	32,402,495	83.4	6,467,920	4,029,595	3,939,570	5,000,772

Revenues and Expenses of Railways

MONTH OF MAY AND FIVE MONTHS OF CALENDAR YEAR 1931—CONTINUED

Name of road		Av. mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	General.	Total.	Operating ratio.	Net from railway operation.	Operating income (or loss).	Net ry. operating income.	Net ry. operating income, 1930.
Maine Central	May	1,121	$1,053,785	$157,474	$1,346,995	$236,388	$233,353	$17,851	$502,847	$45,951	$1,036,903	77.0	$310,092	$217,574	$172,239	$218,927
	5 mos.	1,121	5,254,571	834,386	6,678,504	981,695	1,151,518	85,292	2,645,721	233,353	5,100,381	76.4	1,578,123	1,121,682	818,620	1,318,295
Midland Valley	May	363	148,984	2,829	158,084	33,985	25,278	4,847	43,809	10,247	116,857	73.9	41,227	27,915	19,560	43,532
	5 mos.	363	798,361	14,489	846,315	153,280	112,514	26,730	244,496	47,328	591,619	69.9	254,696	189,955	134,149	319,047
Minneapolis & St. Louis	May	1,627	792,005	29,836	881,821	167,047	177,635	35,792	402,708	60,361	843,815	95.7	38,006	—15,451	—41,450	—67,300
	5 mos.	1,627	3,799,065	161,347	4,245,327	541,954	889,999	186,127	2,070,769	253,561	3,938,883	92.8	306,444	52,521	—73,943	—172,992
Minn., St. Paul & S. S. Marie	May	4,379	2,134,249	151,521	2,519,857	424,373	491,666	83,391	1,025,464	125,659	2,158,852	85.7	361,005	142,669	8,954	273,983
	5 mos.	4,379	10,169,727	819,939	12,038,361	1,752,885	2,699,318	375,756	5,196,634	620,156	10,686,515	88.8	1,351,846	300,266	—370,429	45,965
Duluth, South Shore & Atlantic	May	560	166,821	19,618	229,419	73,738	51,699	7,655	113,511	9,165	257,266	112.1	—27,847	—56,858	—61,518	7,368
	5 mos.	560	1,009,456	112,985	1,236,596	206,604	236,806	39,131	566,329	49,008	1,106,751	89.5	129,845	—22,189	—51,828	59,740
Spokane International	May	163	61,006	2,965	69,572	14,042	6,384	3,441	25,145	5,589	55,241	79.4	14,331	9,296	4,394	6,064
	5 mos.	163	272,232	18,253	315,557	62,917	32,743	16,954	125,664	28,703	270,111	85.6	45,446	20,252	2,151	5,246
Mississippi Central	May	150	68,120	2,303	73,747	14,026	11,893	8,153	23,508	6,802	64,355	87.3	9,392	3,735	—341	7,889
	5 mos.	150	383,899	11,327	409,200	73,077	68,158	44,719	128,423	33,776	348,126	85.1	61,074	32,729	15,728	92,571
Missouri & North Arkansas	May	364	98,863	2,574	108,257	22,960	14,150	8,596	41,783	8,100	95,589	89.3	12,668	10,393	—164	—6,465
	5 mos.	364	507,741	11,866	551,095	117,865	72,563	47,050	218,934	40,262	495,998	90.0	55,097	42,015	—13,509	53,348
Missouri-Illinois	May	202	97,228	1,044	101,430	19,776	22,010	3,315	33,696	5,965	84,762	83.6	16,668	10,108	4,120	19,415
	5 mos.	202	514,074	4,840	530,944	81,117	120,356	17,415	177,491	32,359	427,449	80.5	103,495	74,740	35,100	126,629
Missouri-Kansas-Texas Lines	May	3,188	2,129,762	303,962	2,750,021	399,682	544,946	125,108	993,092	159,163	2,236,044	81.3	513,977	310,208	112,948	412,676
	5 mos.	3,188	10,766,347	1,533,504	13,789,477	1,685,412	2,571,106	621,205	5,005,735	816,366	10,789,119	78.2	3,000,358	1,985,501	1,021,218	2,341,016
Missouri Pacific	May	7,450	6,598,164	629,363	8,074,372	951,819	1,321,077	284,498	2,907,936	332,945	5,798,914	71.8	2,275,458	1,837,406	1,497,106	1,486,067
	5 mos.	7,450	33,833,343	3,199,473	40,750,625	4,712,294	6,825,188	1,396,502	15,068,550	1,749,137	29,809,767	73.2	10,940,858	8,838,204	7,113,329	7,920,588
Gulf Coast Lines	May	1,037	1,085,870	64,985	1,227,360	157,175	168,827	44,006	310,511	63,648	746,669	60.84	480,691	431,770	309,607	363,990
	5 mos.	1,037	5,130,304	401,843	5,869,755	797,543	913,941	225,645	1,646,800	306,193	3,885,280	66.19	1,984,475	1,738,237	1,149,062	1,933,395
International Great Northern	May	1,159	1,679,054	111,200	1,905,001	232,451	300,352	37,620	736,919	61,965	1,346,470	70.68	558,531	514,364	250,653	13,604
	5 mos.	1,159	6,863,378	548,760	7,975,622	1,085,930	1,225,242	192,704	3,195,889	327,511	5,970,627	74.86	2,004,995	1,797,462	942,395	32,600
San Antonio, Uvalde & Gulf	May	316	80,453	10,083	101,565	36,687	14,624	5,440	24,382	6,719	87,382	86.0	14,183	9,426	—19,719	21,277
	5 mos.	316	606,904	52,910	712,028	188,681	96,103	27,715	156,069	33,405	501,475	70.4	210,553	187,146	44,459	98,280
Mobile & Ohio	May	1,152	827,712	36,914	927,757	125,205	177,854	47,609	392,208	50,628	729,980	85.5	134,777	58,304	—20,418	42,278
	5 mos.	1,152	4,231,431	184,619	4,698,661	615,829	894,353	260,015	1,920,663	252,879	3,935,557	83.8	763,104	433,959	115,300	488,317
Monongahela	May	177	373,145	2,555	379,145	60,000	45,000	1,259	86,488	10,038	202,785	53.5	176,360	161,373	90,854	130,418
	5 mos.	177	2,007,800	15,575	2,038,304	300,000	225,000	6,571	506,483	52,737	1,090,335	53.5	947,969	885,512	479,884	557,808
Monongahela Connecting	May	6	.....	.....	105,486	20,522	26,394	304	50,688	2,250	100,428	95.2	5,058	—881	760	25,855
	5 mos.	6	.....	.....	501,553	71,244	127,957	1,504	262,798	14,488	477,991	95.3	23,562	—6,888	—5,811	127,104
Montour	May	57	184,877	.....	185,128	24,783	35,212	1,273	42,384	7,493	111,145	60.0	73,983	71,914	88,598	105,418
	5 mos.	57	839,763	.....	842,532	77,026	205,886	6,808	242,458	37,346	569,470	67.6	273,062	262,718	334,064	356,345
Nash., Chatt. & St. Louis	May	1,203	1,063,109	118,437	1,304,883	250,618	276,264	62,665	519,768	76,962	1,192,620	91.4	112,263	66,719	39,061	68,440
	5 mos.	1,203	5,607,625	662,229	6,925,289	1,157,990	1,419,564	362,487	2,695,469	390,318	6,057,946	87.5	867,343	575,924	485,690	960,258
Nevada Northern	May	165	37,073	1,727	43,723	11,512	4,604	1,023	11,167	4,429	32,735	74.9	10,988	2,810	5,239	15,220
	5 mos.	165	187,685	10,466	222,977	57,045	22,415	4,982	62,476	24,046	170,911	76.7	52,066	13,991	24,522	107,731
Newburgh & South Shore	May	6	.....	.....	113,668	18,096	21,779	.....	44,285	6,567	90,727	79.8	22,941	9,926	13,284	14,145
	5 mos.	6	.....	.....	488,974	109,838	127,234	.....	229,149	35,271	501,492	102.6	—12,518	—77,592	—63,335	195,602
New Orleans Great Northern	May	264	196,900	10,378	212,568	18,115	20,760	13,897	63,722	9,505	125,999	59.3	86,569	76,174	48,971	43,282
	5 mos.	264	859,300	47,471	934,358	97,160	140,704	71,093	275,091	54,177	638,225	68.3	296,133	244,260	149,656	173,233
New Orleans Terminal	May	20	2,412	.....	145,896	17,456	9,819	.....	46,817	2,206	76,298	52.3	69,598	57,625	38,829	54,242
	5 mos.	20	10,402	.....	621,567	85,042	50,657	.....	248,361	8,413	392,473	63.1	229,094	169,294	67,828	180,187
New York Central	May	11,421	21,066,839	7,133,910	32,670,688	3,967,419	6,981,844	761,665	12,441,499	1,308,519	25,945,703	79.4	6,724,985	3,967,719	2,852,462	5,877,522
	5 mos.	11,421	107,591,750	37,209,702	165,681,886	19,725,753	36,417,526	3,647,636	63,408,382	6,759,999	132,599,040	80.0	33,082,846	19,135,406	12,991,363	25,823,142
Indiana Harbor Belt	May	118	.....	.....	783,841	70,000	95,000	4,610	330,005	27,099	537,325	68.6	246,516	199,804	129,902	267,511
	5 mos.	118	.....	.....	4,014,002	350,000	475,000	23,297	1,890,327	141,158	2,975,394	74.1	1,038,608	820,695	644,273	1,012,939
Pittsburgh & Lake Erie	May	235	1,412,727	101,780	1,561,423	160,616	478,970	32,570	617,302	76,053	1,369,416	87.7	192,007	87,697	285,574	763,592
	5 mos.	234	7,241,415	570,151	8,053,655	701,546	2,381,443	164,237	3,144,943	391,379	6,802,509	84.5	1,251,146	696,460	1,652,662	2,896,581
New York, Chicago & St. Louis	May	1,698	2,908,894	129,817	3,160,575	471,579	515,138	128,681	1,152,303	127,601	2,404,942	76.1	755,633	530,280	264,692	538,048
	5 mos.	1,698	15,097,674	602,031	16,267,888	1,865,572	2,931,196	617,212	6,162,087	641,577	12,241,346	75.2	4,026,542	2,895,427	1,549,816	2,770,918
N. Y., New Haven & Hartford	May	2,101	4,908,954	2,891,214	8,798,056	1,309,648	1,205,719	104,903	2,822,001	297,128	5,903,312	67.1	2,894,744	2,394,517	1,788,559	2,115,747
	5 mos.	2,117	23,218,846	14,876,075	43,049,940	5,198,737	6,645,798	473,824	14,697,743	1,482,801	29,327,884	68.1	13,722,056	11,064,518	8,022,668	9,821,477

Revenues and Expenses of Railways

MONTH OF MAY AND FIVE MONTHS OF CALENDAR YEAR 1931—CONTINUED

Name of road		Av. mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	General.	Total.	Operating ratio.	Net from railway operation.	Operating income (or loss).	Net ry. operating income.	Net ry. operating income, 1930.
New York Connecting	May	20	$163,960	$.....	$185,357	$28,582	$4,989	$.....	$33,087	$1,253	$67,911	36.6	$117,446	$81,646	$54,280	$86,422
	5 mos.	20	856,012	.....	951,806	83,473	30,745	.....	178,362	5,375	297,952	31.3	653,854	469,854	326,192	455,421
New York, Ontario & Western	May	568	778,054	65,535	993,609	128,868	164,524	14,802	365,899	26,924	703,764	70.8	289,845	247,316	177,707	33,414
	5 mos.	568	3,475,160	200,123	4,355,613	438,629	794,936	74,123	1,818,478	141,823	3,285,766	75.4	1,069,847	857,062	530,568	21,328
Norfolk & Western	May	2,242	5,964,445	228,854	6,460,755	847,209	1,241,122	129,994	1,738,362	277,392	4,241,400	65.6	2,219,355	1,544,177	1,603,463	2,885,800
	5 mos.	2,238	29,873,628	1,147,485	32,247,935	4,010,168	6,671,911	614,102	8,836,239	1,293,781	21,477,285	66.6	10,770,650	7,244,141	7,794,339	13,093,539
Norfolk Southern	May	932	467,424	15,844	507,070	86,554	82,983	22,997	215,586	24,876	432,887	85.4	74,183	25,546	3,864	1,222
	5 mos.	932	2,275,681	72,761	2,483,179	388,476	419,755	126,974	1,059,329	124,872	2,118,834	85.3	364,345	120,057	42,911	209,438
Northern Pacific	May	6,789	4,272,322	469,996	5,253,204	1,052,716	1,332,651	221,957	1,937,240	241,764	4,862,435	92.6	390,769	—263,789	40,439	560,189
	5 mos.	6,789	20,602,913	2,130,672	25,200,971	3,939,827	6,409,659	1,039,243	9,956,113	1,307,003	23,031,620	91.4	2,169,351	—1,095,076	456,000	1,902,341
Northwestern Pacific	May	441	188,505	123,843	346,743	72,103	51,403	6,748	180,929	15,702	326,694	94.2	20,049	—15,988	—28,886	—2,800
	5 mos.	441	838,191	527,263	1,535,621	449,147	340,612	32,038	875,003	86,608	1,781,387	116.0	—245,766	—425,806	—473,500	—313,042
Oklahoma City-Ada-Atoka	May	132	64,506	1,676	68,426	14,679	4,415	1,415	17,858	2,896	41,093	60.1	27,333	22,355	8,581	—13,826
	5 mos.	132	258,864	7,792	278,711	73,338	19,057	6,187	85,953	15,563	199,397	71.5	79,314	54,383	—1,871	—27,370
Pennsylvania R. R.	May	10,899	27,664,079	7,523,849	39,310,633	4,771,327	8,592,520	801,628	15,118,874	1,591,340	31,379,346	79.8	7,931,287	4,873,126	3,690,063	9,640,633
	5 mos.	10,899	136,884,322	39,027,015	195,113,926	24,957,274	42,269,835	3,989,359	76,891,578	8,051,804	158,939,214	81.5	36,174,712	23,885,319	18,288,168	39,146,029
Long Island	May	404	880,362	2,179,404	3,212,765	259,598	487,168	16,203	1,214,382	64,381	2,041,701	63.5	1,171,064	873,465	695,032	610,034
	5 mos.	404	4,128,048	9,476,419	14,355,672	1,432,036	2,375,281	81,081	6,033,301	311,305	10,232,871	71.3	4,122,801	3,217,875	2,392,101	2,092,416
Peoria & Pekin Union	May	17	8,884	507	90,997	15,434	13,174	4,810	45,667	7,045	86,130	94.7	4,867	—9,633	14,265	13,578
	5 mos.	17	42,153	2,564	499,379	60,036	57,673	25,014	250,712	38,574	432,009	86.5	67,370	—13,130	117,563	133,857
Pere Marquette	May	2,265	2,088,718	111,539	2,361,030	384,848	450,537	70,110	945,972	105,768	1,965,009	83.2	396,021	242,560	136,438	382,506
	5 mos.	2,265	10,450,896	610,283	11,764,002	1,881,990	2,347,259	347,267	4,815,116	519,703	9,949,498	84.6	1,814,504	1,049,494	631,518	1,747,789
Pittsburgh & Shawmut	May	102	87,669	1,194	89,346	12,590	18,937	1,491	22,026	4,726	59,770	66.9	29,576	28,490	30,537	28,730
	5 mos.	102	381,841	8,124	393,953	63,543	108,655	8,088	108,145	21,443	309,874	78.7	84,079	76,876	78,172	142,868
Pittsburgh & West Virginia	May	92	257,949	2,079	280,919	31,981	70,341	19,091	57,677	16,452	204,671	72.9	76,248	46,200	90,052	184,390
	5 mos.	92	1,187,309	10,969	1,328,533	144,227	336,412	98,872	269,954	93,362	988,709	74.4	339,824	217,803	376,144	670,626
Pittsburgh, Shawmut & Northern	May	198	109,278	316	111,074	23,165	19,115	1,523	40,018	7,329	91,150	82.1	19,924	17,129	11,552	11,592
	5 mos.	198	526,556	1,924	539,747	79,938	98,498	7,453	189,105	34,108	409,102	75.7	130,645	116,651	98,972	116,135
Quincy, Omaha & Kansas City	May	249	28,763	3,601	37,950	18,332	3,676	741	17,906	2,233	42,777	112.7	—4,827	—9,586	—11,847	—14,408
	5 mos.	249	133,052	17,677	176,262	73,518	26,322	4,740	98,489	11,501	214,033	121.4	—37,771	—61,551	—73,429	—46,868
Reading	May	1,454	5,212,449	404,247	6,029,109	941,190	1,564,816	97,042	2,504,152	208,011	5,337,057	88.5	692,052	486,215	462,949	1,301,601
	5 mos.	1,454	27,344,777	2,072,625	31,531,242	4,728,709	8,312,990	464,480	12,912,568	1,127,803	27,654,514	87.7	3,876,728	2,763,648	2,599,968	4,881,151
Atlantic City	May	163	125,667	86,720	225,832	49,913	20,295	5,235	150,612	4,060	230,208	101.9	—4,376	—45,976	—56,523	—104,427
	5 mos.	163	533,531	297,419	891,114	288,125	95,503	19,379	741,817	21,276	1,167,104	131.0	—275,990	—483,990	—532,026	—558,543
Richmond, Fredericksburg & Potomac	May	117	594,367	177,855	924,138	83,329	145,467	8,177	314,387	34,179	604,833	65.4	319,305	267,883	185,634	104,972
	5 mos.	117	2,352,709	1,338,596	4,529,783	332,450	748,176	46,666	1,551,315	183,947	2,972,154	65.6	1,557,629	1,285,954	923,930	800,043
Rutland	May	413	249,853	48,661	386,647	72,434	77,390	12,063	166,155	20,147	349,926	90.5	36,721	15,928	18,062	71,944
	5 mos.	413	1,139,589	298,121	1,871,073	360,737	384,960	56,330	835,425	86,256	1,732,192	92.6	138,881	34,586	58,490	225,678
St. Louis San Francisco	May	5,266	4,013,654	496,859	4,944,920	515,775	830,873	113,029	1,728,231	198,043	3,426,839	69.30	1,518,081	1,145,587	1,089,652	1,148,988
	5 mos.	5,266	19,200,555	2,402,118	23,679,713	2,528,241	4,268,377	592,422	8,650,724	1,029,324	17,244,991	72.83	6,434,722	4,683,251	4,448,660	6,452,423
Ft. Worth & Rio Grande	May	233	70,452	4,266	81,850	17,852	15,683	3,357	39,379	4,678	80,921	98.9	929	—3,531	—15,343	—28,234
	5 mos.	233	219,376	18,884	274,656	90,843	69,870	15,462	175,853	20,985	372,720	135.7	—98,064	—121,225	—170,087	—135,943
St. Louis, San Francisco & Texas	May	262.02	82,393	7,227	94,279	25,506	17,920	5,600	53,415	7,363	110,023	116.7	—15,744	—19,978	—50,430	—80,240
	5 mos.	262.02	441,941	34,771	499,461	118,463	92,506	29,520	255,619	39,096	535,470	107.2	—36,009	—57,104	—212,515	—140,215
St. Louis Southwestern Lines	May	1,913	1,453,727	47,935	1,612,016	148,586	198,930	90,456	547,618	87,165	1,080,009	67.0	532,007	441,010	305,160	223,852
	5 mos.	1,913	6,793,588	223,645	7,531,472	992,915	1,198,820	514,030	2,724,820	426,390	5,884,173	78.1	1,647,299	1,205,296	506,499	1,074,326
San Diego & Arizona	May	155	85,828	7,153	94,552	15,096	13,393	3,413	23,526	7,260	63,779	67.5	30,773	25,194	26,118	28,987
	5 mos.	155	282,862	79,559	373,105	70,994	73,317	17,233	112,160	36,334	315,737	84.6	57,368	29,464	37,443	124,568
Seaboard Air Line	May	4,480	3,496,896	339,906	4,187,518	904,387	689,616	176,773	1,459,092	178,118	3,403,451	81.3	784,067	443,617	317,198	411,153
	5 mos.	4,481	16,697,255	2,412,788	21,138,434	3,470,084	3,671,399	916,349	7,429,322	884,518	16,619,836	78.6	4,518,598	2,812,729	2,119,906	3,322,818
Southern Ry.	May	6,730	6,777,266	1,071,746	8,593,166	1,314,760	1,802,781	217,802	3,267,241	341,052	7,002,137	81.5	1,591,021	132,386	700,527	1,479,716
	5 mos.	6,730	33,977,169	5,528,241	42,994,358	6,685,053	9,009,723	1,130,937	16,466,885	1,714,528	35,325,909	82.2	7,668,449	4,383,239	3,310,477	7,256,232
Alabama Great Southern	May	315	428,293	72,301	542,062	108,834	148,702	15,030	196,721	22,315	495,531	91.4	46,331	3,823	15,237	106,759
	5 mos.	315	2,145,892	339,445	2,683,848	544,674	664,480	83,035	982,995	111,668	2,409,318	89.8	274,530	59,869	117,825	551,301
Cinn., New Orleans & Tex. Pac.	May	338	1,143,655	107,051	1,352,730	227,309	330,207	37,171	391,603	52,927	1,044,975	77.2	307,755	232,961	216,433	265,848
	5 mos.	338	5,363,874	687,552	6,461,763	1,221,510	1,616,263	180,291	2,074,329	268,966	5,402,741	83.6	1,059,028	691,799	678,453	1,510,878

Revenues and Expenses of Railways

MONTH OF MAY AND FIVE MONTHS OF CALENDAR YEAR 1931—CONTINUED

Name of road		Av. mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of Way and structures.	Maintenance of Equip. ment.	Traffic.	Transportation.	General.	Total.	Operating ratio.	Net from railway operation.	Operating income (or loss).	Net ry. operating income.	Net ry. operating income, 1930.
Georgia Southern & Florida	May	397	$226,768	$36,013	$282,517	$60,549	$62,695	$2,554	$97,652	$2,479	$229,370	81.2	$53,147	$34,663	$22,978	$244
	5 mos.	397	959,307	303,714	1,376,943	286,678	306,566	11,074	501,832	13,919	1,148,081	83.4	228,862	131,863	114,976	171,923
New Orleans & Northeastern	May	204	224,678	35,076	281,513	50,547	64,485	8,624	107,382	14,247	247,455	87.9	34,058	—4,383	—25,636	61,121
	5 mos.	204	1,092,144	173,083	1,367,809	256,417	328,457	48,648	535,596	70,447	1,252,248	91.6	115,561	—83,115	—201,312	131,759
Northern Alabama	May	110	57,958	2,121	62,227	11,339	2,761	1,783	24,028	2,683	42,594	68.4	19,633	14,103	—3,481	1,396
	5 mos.	110	286,010	11,797	308,855	84,218	12,978	8,947	120,390	14,271	240,804	78.0	68,051	40,387	—31,582	43,952
Southern Pacific	May	9,127	9,645,604	2,459,394	13,374,896	1,448,357	1,898,540	409,847	4,626,781	606,769	9,238,475	69.1	4,136,421	3,193,592	2,682,662	2,626,594
	5 mos.	9,127	44,155,420	11,905,997	61,816,234	8,005,866	11,646,142	1,848,208	22,519,966	3,084,279	48,283,757	78.1	13,532,477	1,732,423	6,006,778	10,958,824
So. Pacific Steamship Lines	May	....	464,819	39,558	534,230	19,176	149,274	21,274	63,550	31,762	620,036	116.1	—85,806	—87,367	—87,499	—37,807
	5 mos.	....	2,261,162	186,217	2,617,716	103,047	748,581	102,386	2,017,569	162,553	3,132,136	119.7	—514,420	—520,859	—521,519	—312,402
Texas & New Orleans	May	4,700	2,892,535	488,361	3,931,670	654,227	668,773	179,717	1,486,517	230,334	3,226,232	82.1	705,438	417,499	136,756	329,723
	5 mos.	4,700	14,833,564	2,532,276	19,475,350	3,260,015	4,046,413	832,773	7,392,792	1,185,887	16,786,385	86.2	2,688,965	1,428,015	238,757	1,850,942
Spokane, Portland & Seattle	May	555	472,399	52,859	572,763	53,914	78,320	11,720	187,059	22,619	355,871	62.1	216,892	130,970	116,321	95,368
	5 mos.	555	2,005,791	236,754	2,470,005	271,545	395,399	56,500	863,863	113,103	1,711,136	69.3	758,869	329,036	308,746	412,887
Tennessee Central	May	295	203,459	7,844	221,735	39,932	33,471	8,563	83,963	13,399	178,902	80.7	42,833	37,354	21,286	42,296
	5 mos.	295	1,055,117	41,246	1,151,525	231,087	190,071	43,881	425,775	70,556	959,372	83.3	192,153	163,960	84,191	68,741
Term. R. R. Assn. of St. L.	May	55	.....	.....	715,240	67,244	55,339	4,116	329,245	21,990	480,841	67.2	234,339	138,832	214,853	208,375
	5 mos.	55	.....	.....	3,512,738	479,472	344,848	18,302	1,715,869	117,294	2,690,564	76.6	822,174	362,950	759,946	1,038,975
Texas & Pacific	May	1,950	2,109,325	299,283	2,635,268	319,387	408,774	77,676	794,521	112,715	1,739,191	66.0	896,077	745,189	557,207	491,087
	5 mos.	1,953	10,458,242	1,455,021	12,991,913	1,570,133	2,090,754	406,142	4,195,349	582,415	8,919,045	68.7	4,072,868	3,383,917	2,427,468	2,777,832
Texas Mexican	May	162	85,802	1,346	96,907	17,931	14,460	3,585	38,898	8,243	82,407	85.0	14.500	9,493	117	5,505
	5 mos.	162	361,761	8,808	448,315	84,015	79,019	17,736	199,777	39,195	416,731	93.0	31,584	6,527	—26,220	—6,950
Toledo, Peoria & Western	May	239	119,527	128	122,598	19,185	14,167	14,412	48,611	8,717	105,092	85.7	17,506	13,889	7,347	10,031
	5 mos.	239	637,405	587	562,237	108,741	63,907	71,968	240,570	44,550	529,736	81.2	122,501	98,248	68,081	57,328
Toledo Terminal	May	28	.....	.....	92,687	25,152	14,267	609	37,292	5,024	82,340	88.8	10,347	—3,819	19,497	—3,328
	5 mos.	28	.....	.....	475,952	65,583	69,710	2,860	195,826	24,627	358,600	75.3	117,352	46,967	168,302	143,328
Ulster & Delaware	May	128	41,253	3,476	84,346	18,281	12,994	1,196	39,076	4,029	75,576	89.6	8,770	1,770	—1,520	12,840
	5 mos.	128	153,156	10,565	350,274	69,193	60,878	5,681	176,381	19,388	331,521	94.6	18,753	—5,647	—15,980	—18,500
Union R. R. of Penna.	May	45	.....	.....	448,586	85,611	147,529	205	215,815	14,283	463,443	103.3	—14,857	—23,357	28,817	281,718
	5 mos.	45	.....	.....	2,160,452	462,040	747,069	804	1,178,863	72,213	2,460,948	113.9	—300,496	—347,396	—82,059	654,854
Union Pacific	May	3,765	6,051,565	850,145	7,674,527	1,023,013	1,659,787	195,129	2,237,011	345,899	5,596,784	72.9	2,077,743	1,468,473	1,170,418	1,243,611
	5 mos.	3,765	28,759,532	3,784,880	35,933,172	3,915,139	8,352,565	851,180	10,931,408	1,696,183	26,355,395	73.3	9,577,777	6,435,430	5,210,641	5,862,114
Oregon Short Line	May	2,531	1,811,901	178,045	2,176,285	469,078	378,688	59,474	689,788	127,889	1,769,283	81.3	407,002	117,215	23,968	64,879
	5 mos.	2,531	9,730,627	873,570	11,484,423	1,740,618	1,983,544	270,964	3,627,862	626,145	8,501,483	74.0	2,982,940	1,537,699	1,050,022	1,450,951
Oregon Wash. R. R. & Nav. Co.	May	2,337	1,443,770	147,756	1,797,573	337,192	244,823	76,609	651,059	123,100	1,446,641	80.5	350,932	167,483	66,083	—49,880
	5 mos.	2,337	6,449,385	683,874	8,019,584	1,612,191	1,290,449	360,782	3,409,066	618,743	7,384,718	92.1	634,866	—282,119	—813,877	—154,331
Los Angeles & Salt Lake	May	1,249	1,217,671	272,315	1,640,999	303,113	237,741	84,273	537,707	85,385	1,301,360	79.3	339,639	189,691	76,447	152,719
	5 mos.	1,244	6,234,251	1,128,162	8,083,154	1,547,556	1,386,990	372,618	2,690,962	424,922	6,672,845	82.6	1,410,309	677,737	40,449	669,838
St. Joseph & Grand Island	May	258	264,092	5,266	286,358	129,593	35,213	3,595	87,011	18,652	280,857	98.1	5,501	—7,358	—36,834	13,103
	5 mos.	258	1,280,051	23,373	1,357,564	282,291	170,113	17,291	429,448	87,927	997,661	73.5	359,903	274,993	144,276	238,141
Utah	May	111	54,065	.....	53,966	12,221	18,841	360	17,118	5,828	54,368	100.7	—402	—4,619	—14,617	—7,138
	5 mos.	111	537,079	36	540,133	72,662	153,559	1,820	130,586	27,689	385,360	71.3	154,773	112,625	57,755	76,748
Virginian	May	569	1,185,684	12,528	1,262,588	123,188	243,566	15,971	272,200	32,137	685,075	54.3	577,513	422,513	494,516	460,749
	5 mos.	563	5,978,703	74,874	6,426,820	659,072	1,287,778	76,926	1,436,999	159,939	3,623,650	56.4	2,803,170	2,038,102	2,388,033	3,037,494
Wabash	May	2,523	3,772,592	351,745	4,523,663	398,862	824,835	205,311	1,966,595	216,976	3,631,951	80.3	891,712	663,220	259,482	583,248
	5 mos.	2,523	18,052,986	1,724,562	21,381,567	1,657,926	3,774,062	940,317	9,710,944	1,114,289	17,298,491	80.9	4,083,076	3,101,036	1,161,898	2,907,428
Ann Arbor	May	293	346,736	4,941	363,325	24,422	77,094	16,604	167,457	17,584	303,086	83.4	60,239	37,656	15,832	41,910
	5 mos.	293	1,721,090	28,120	1,799,700	130,245	342,661	74,207	830,455	88,142	1,465,676	81.4	334,024	223,856	102,372	183,177
Western Maryland	May	891	1,109,004	8,476	1,160,918	181,591	195,082	43,282	335,276	44,531	802,619	69.1	358,299	283,299	288,501	441,414
	5 mos.	895	6,090,165	47,100	6,382,575	914,399	1,088,937	222,692	1,776,555	211,010	4,230,290	66.3	2,152,285	1,777,285	1,805,836	2,261,446
Western Pacific	May	1,051	917,150	68,918	1,110,952	303,872	243,489	79,334	468,947	45,344	1,160,824	104.5	—49,872	—140,906	—131,705	—179,120
	5 mos.	1,051	4,284,745	273,996	4,953,425	1,040,296	1,113,983	346,160	2,273,623	247,816	5,107,625	103.1	—154,200	—620,031	—557,350	—579,898
Wheeling & Lake Erie	May	511	1,047,660	8,898	1,111,209	145,648	288,210	35,501	343,825	40,163	854,351	76.9	256,858	149,800	139,902	496,448
	5 mos.	511	4,682,560	52,373	5,010,388	542,664	1,417,190	173,872	1,660,445	200,921	4,000,413	79.8	1,009,975	497,746	470,127	1,455,646
Wichita Falls & Southern	May	203	51,097	56	52,497	10,789	9,629	2,297	16,863	3,075	42,253	80.49	10,244	6,039	2,711	10,271
	5 mos.	203	238,356	531	246,691	51,503	44,013	12,481	92,578	18,610	216,986	87.96	29,705	7,472	—12,222	51,304

NEWS

(*Continued from page 63*)

merce counsel of the Iowa Board of Railroad Commissioners, asking if his letter and telegram of protest against the proposed 15 per cent increase in freight rates asked by the railroads means that the Iowa commission has "prejudged" the case. Mr. Henderson, in his telegram to the commission, declared that the proposed increases, as applied to Iowa traffic, would create unjust and burdensome rates. Mr. Cole, calling attention to the fact that the railroads have also applied to all the state commissions for authority to make a similar increase in intrastate rates, asked Mr. Henderson if the protest meant that the Iowa commission had already prejudged the case, which is also to be submitted to it, without having heard any of the testimony and evidence to be presented before the federal and state commissions.

Grade Separation in Missouri

Seventy per cent of the 731 grade crossings on the primary highway system in Missouri as of January 1, 1922, have been eliminated, according to an announcement by the state highway department. The more than 500 rail-highway crossings have been eliminated by relocation of state highways or by the construction of grade separation structures in cooperation with the railroads.

Through Rates With Boat Line Ordered

The Interstate Commerce Commission has ordered the railroads serving Augusta and Savannah, Ga., and their connections to establish through routes and joint freight rates with the Augusta-Savannah Line, owned and operated by the city of Augusta, which operates a 300-ton steamboat on the Savannah river between Augusta and Savannah.

Sanchez Mejorada to Continue as Head of Mexican National

The board of directors of the National Railways of Mexico have approved an agreement recently signed with J. Sanchez Mejorada, which provides that he continue as executive president of those lines for a period of five years. The agreement was reached following the completion of one year's service by Mr. Sanchez Mejorada under the supervision of the new board of directors.

Rock Island Missouri License Renewed

The Missouri Supreme Court on June 30 ordered Secretary of State Becker to renew the Missouri license of the Chicago, Rock Island & Pacific. Last year Secretary Becker declined to extend the Rock Island's Missouri charter when the railroad increased its capital stock from $140,000,000 to $170,000,000 and tendered payment of fees on only the increase of $30,000,000. Becker demanded the payment of fees on the full capital of $170,000,000, contending that a state law exempting railroads which already had their lines in Missouri was unconstitutional. The supreme court holds that the secretary cannot refuse to perform a ministerial act because he believes a law to be unconstitutional. Under the court ruling the railroad will pay fees of $1,105, compared with $35,000 if it had to pay on the full $170,000,000.

Death of Professor Swain

Professor George F. Swain, of Boston, since 1909 professor of civil engineering at Harvard University, died at his summer home in Ashland, N. H., on July 1 at the age of 74. Professor Swain was one of the best known civil engineers in America, having held the chair of civil engineering at the Massachusetts Institute of Technology from 1887 to 1909, going to Harvard in the latter year. He retired in 1929. He was author of several text books; was consulting engineer of the Massachusetts Railroad Commission for 27 years, ending with 1914, and for several years was chairman of the Boston Transit Commission.

Rain Storms Block Mexican Railway Services

A passenger train on the Southern Pacific of Mexico northbound from Guadalajara, Jal., to Nogales, Son., was stalled for three days in Tunnel No. 18 by a slide, caused by rains, at its north end. Further slides occurred at the south end while the train was in the tunnel. The train was released on June 30 and no injuries resulted to passengers. Damage to track and roadbed by these slides amounted to more than $250,000. Additional slides which interrupted traffic occurred between Tunnels Nos. 23 and 24 on June 30.

Heavy rains during the latter part of June interrupted train service at various points on the Cardenas, Mexico, Guadalajara, Pacific, Jalapa and Isthmus divisions of the National Railways of Mexico.

Western Grain Rate Reduction Ordered Effective August 1

The Interstate Commerce Commission on July 3 ordered a postponement from June 1 to August 1 of the effective date of its order revising freight rates on grain and grain products in the western district and for export, which was issued about a year ago, and which had been stayed in operation from May 7 to July 6 by order of the federal district court for the northern district of Illinois, to which the roads had applied for an injunction. The revision is generally downward, although it includes some increases, and the railroads had estimated it would reduce their revenues by $20,000,000 a year. The commission is thus giving the roads an opportunity to file the rates on ten days' notice, following the announcement by the court on June 30 that the temporary injunction would be dissolved.

P. R. R. To Extend New Jersey Motor Coach Route

The Board of Public Utilities Commissioners of New Jersey has approved municipal consents which had been obtained by the Pennsylvania General Transit Company, highway subsidiary of the Pennsylvania, for the extension of its Seaside Park-Toms River, N. J. motor coach route to serve Island Heights, N. J. The order also permits the operation of seven additional buses on the route.

The application of the Pennsylvania arose from the conditional approval which it received for the abandonment of train service in its Island Heights branch. The abandonment application was granted temporarily, its permanency being subject to the determination of the adequacy of the bus service to meet the demands of the traffic.

Power Reverse Gear Hearings Adjourned to September

Hearings before Special Examiner J. L. Rogers of the Interstate Commerce Commission on the complaint filed by the two enginemen's brotherhoods asking the commission to require that all locomotives be equipped with power reverse gear have been adjourned until September 28, when the rebuttal testimony on behalf of the railroads will be continued. The roads have thus far put on the stand 118 witnesses, of which approximately one hundred were locomotive enginemen who disagreed with the witnesses presented on behalf of the brotherhoods and took the position that in the present stage of development the power reverse gear is not sufficiently safe and efficient to warrant the equipment of all locomotives with such devices.

"We Are the Unhurt"

The regular monthly circular of the Safety Section of the American Railway Association—No. 308, dated July 15—consists mainly of a condensed record—taken from the tabulations of the National Safety Council—showing the great success of the campaign, begun in 1923, under which in seven years the railroads of the country reduced casualties to employees by 77 per cent.

The circular opens with an appeal for equally energetic endeavors in the campaign to make a further reduction of 33 per cent in casualties to employees by 1933. L. G. Bentley, chairman of the committee issuing the circular, congratulates the railroad employees who are thus shown to have put forth intelligent efforts looking to the safety of themselves and fellow employees, and, addressing them as the "unhurt," drops into poetry. His fourth and last stanza reads:

"We are the Unhurt," thus we boast;
"We are the Careful"—Come join our host,
So that, when three short years are fled,
Ye be not numbered with the dead,
But here with us—STILL THE UNHURT.

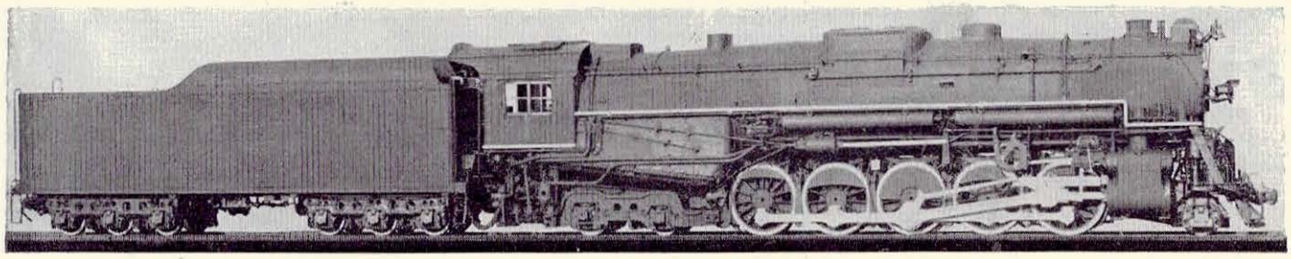
Fire Extinguishing Tests

Representatives of the Pennsylvania, Erie and the Lehigh Valley were among those attending the fire extinguishing tests conducted recently by the Pyrene Manufacturing Company at its test field in Newark, N. J. Over 30 fires, including motor truck, cabin motor boat, electrical switchboard, oil and gasoline pit, rubbish pile, oil barrel and other difficult hazards, were ignited. The demonstration showed the correct manner to attack such fires

Continued on Next Left Hand Page

LABAR

SUPER-POWER



PROGRESSIVE ROADS with foresight to provide themselves with Super-Power are now profiting. Out of a decreased gross they are getting a high net return.

LIMA LOCOMOTIVE WORKS

Incorporated

LIMA — LIMA LOCOMOTIVE WORKS INCORPORATED — **OHIO**

latter date he was promoted to the position of chief train despatcher. Mr. Daggett was appointed superintendent of car service, with headquarters at Bangor, Me., in October, 1917, serving in that capacity until his recent appointment as superintendent of the Northern division, which became effective on May 20.

TRAFFIC

K. R. Kriebel has been appointed general agent for the Chicago, Springfield & St. Louis, at Cleveland, Ohio.

E. L. Bodge has been appointed general agent of the Litchfield & Madison, with headquarters at Kansas City, Mo.

W. E. Kennedy, foreign freight traffic manager of the Mobile & Ohio, with headquarters at Mobile, Ala., has been promoted to assistant freight traffic manager, with the same headquarters.

George C. Potter has been appointed general freight agent of the Danville & Western, the Carolina & Northwestern, the High Point, Randleman, Asheboro & Southern, the Blue Ridge Railway and the Yadkin Railroad Company, with headquarters at Atlanta, Ga., succeeding **C. B. Walker,** who has resigned.

H. E. Yerkes, traveling passenger agent of the Central of New Jersey, with headquarters at Wilkes-Barre, Pa., has been appointed assistant general passenger agent, with headquarters at New York, succeeding **Howard E. Simpson,** recently appointed general eastern passenger agent of the Baltimore & Ohio. **E. L. Tomlinson** will succeed Mr. Yerkes as traveling passenger agent at Wilkes-Barre.

The Missouri-Kansas-Texas, in order to give increased attention to specific classes of freight, has created three new positions with jurisdiction over perishable, grain and cotton traffic respectively. **C. L. Lyons,** executive general agent at Kansas City, Mo., has been appointed general perishable traffic representative, with headquarters at the same point. **William A. Springall,** division freight agent at Oklahoma City, Okla., has been appointed general grain traffic representative, with headquarters at that point. **B. A. Erwin** has been appointed general cotton traffic representative, with headquarters at Houston, Tex. **Columbus Haile, Jr.,** general freight agent at Kansas City, has been transferred to St. Louis, Mo.

C. F. Keller, who has been appointed general freight agent of the Lehigh & New England, with headquarters at Bethlehem, Pa., as announced in the *Railway Age* of July 4, first entered railroad service with the Erie in November, 1907. From that date until March, 1920, he served in various clerical and stenographic positions and was engaged in rate work in the operating department, also serving in minor positions in the secretary's office and the traffic department. He became office manager in the vice-president's office (traffic department) in March, 1920, and in January, 1925, was appointed coal freight agent for the Erie, serving in that position until his recent appointment as general freight agent for the Lehigh & New England, which became effective on July 1.

C. F. Keller

Howard E. Simpson, assistant general passenger agent of the Central of New Jersey at New York, has been appointed general eastern passenger agent for the Baltimore & Ohio, with headquarters in the Chanin building, New York. Mr. Simpson was born in Jersey City, N. J., on March 15, 1896. He entered the service of the Jersey Central in 1912 as clerk, serving in that capacity and in various minor positions until November, 1917. From the latter date until May, 1919, Mr. Simpson served in the United States Navy, then returning to the Jersey Central as purser on the steamer "Sandy Hook," operated by that road. He became rate clerk in 1920 and two years later was appointed city passenger agent at New York. From 1925 to 1926, Mr. Simpson was advertising agent and from January to May of the latter year he served as district passenger agent at Newark, N. J. From May to July, 1926, he was general eastern passenger agent at New York, and on the latter date was appointed assistant general passenger agent at the same point, in which position he served until his recent appointment as general eastern passenger agent of the Baltimore & Ohio.

Howard E. Simpson

ENGINEERING AND SIGNALING

The headquarters of **Heron Cabrera,** chief engineer of the National of Mexico, were transferred to Buenavista station, Mexico, D. F., on July 1.

J. S. McBride, valuation engineer of the Chicago & Eastern Illinois, has been promoted to chief engineer, with headquarters as before at Chicago, to succeed **L. C. Hartley,** who has retired on account of ill health.

Morris S. Blaiklock, assistant chief engineer of the Canadian National, with headquarters at Montreal, Que., has retired from the service of that road after more than half a century with the company. He will continue to act as chairman of the General Co-operative Committee of Maintenance of Way employees.

PURCHASES AND STORES

R. E. Simmons, storekeeper on the Louisiana & Arkansas, with headquarters at Shreveport, La., has been transferred to Minden, La.

J. F. Hibbard, stationer of the Kansas City Southern, with headquarters at Kansas City, Mo., has retired from active duty after 28 years of service with that company, 20 years of which were spent as stationer.

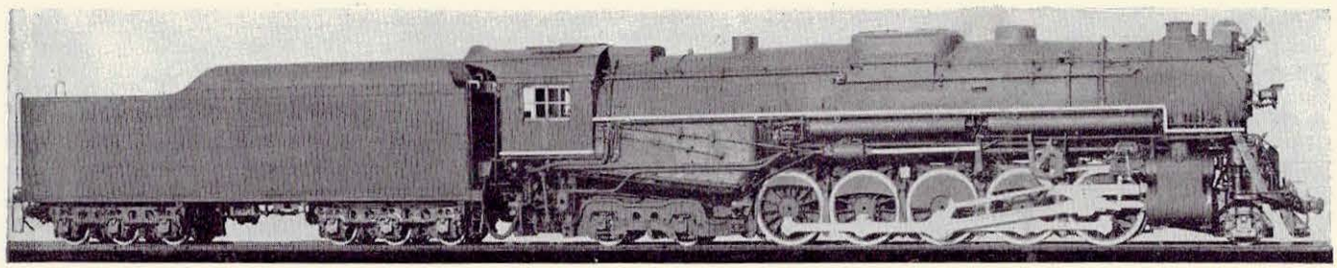
SPECIAL

George D. Moffett, industrial commissioner of the Pere Marquette, with headquarters at Detroit, Mich., has also been appointed industrial commissioner of the Chesapeake & Ohio. Mr. Moffett succeeds **K. T. Crawley,** who has been appointed special representative of the development department of the C. & O., with headquarters as before at Richmond, Va. **C. H. Slayman,** industrial engineer of the Pere Marquette, has been promoted to assistant industrial commissioner of that railroad, with headquarters as before at Detroit.

OBITUARY

Wilson E. Symons, successively superintendent of motive power and equipment of the Plant System (now the Atlantic Coast Line), mechanical superintendent of the Gulf, Colorado & Santa Fe and superintendent of machinery of the Kansas City Southern from 1898 to 1905, died on May 1, at the age of 72 years. At the time of his retirement from active duty in 1905, Mr. Symons had spent 45 years in railway service.

SUPER-POWER



PROGRESSIVE ROADS with foresight to provide themselves with Super-Power are now profiting. Out of a decreased gross they are getting a high net return.

LIMA LOCOMOTIVE WORKS

Incorporated

LIMA — LIMA LOCOMOTIVE WORKS INCORPORATED — **OHIO**

and also explained the effects on the burning materials of the chemicals used.

Among the most spectacular fires was that of a large delivery truck, the motor of which was thoroughly saturated with gasoline, the gasoline feed line broken to provide a running stream, and a match applied. As a final climax to the afternoon, a 500 square foot area of oil in a tank pit was fired and put out while flames swept over an adjacent 200-foot area of gasoline without igniting it. A protecting blanket of foam had previously been laid over this gasoline to demonstrate how modern chemicals successfully protect highly flammable materials.

Ambrose Swasey Gives Additional $250,000 to Foundation

Ambrose Swasey, founder of the Engineering Foundation, has recently added $250,000 to his previous gifts, bringing his total contributions to the fund to $750,000. Mr. Swasey made his latest gift at a dinner in his honor at the University Club, New York City. Among those attending the dinner were more than 30 presidents and former presidents of national engineering societies, of the United Engineering Trustees and of the Engineering Foundation, and other nationally prominent engineers.

In making the gift Mr. Swasey said, "For many years past, and especially since 1914, I have thought that a great service to mankind might be rendered by the stimulation of research and development work in the engineering profession, and have sought to further that end by assisting in establishing The Engineering Foundation whose income would be available for such purposes.

"It has been my privilege on previous occasions to assist in the endowment of this Foundation, and, having a high appreciation of the very practical and helpful results that have been already achieved, and believing that the broad and well laid plans of the Foundation promise even greater service in the future, I now take great pleasure in making available to The Engineering Foundation, through United Engineering Trustees, Inc., an additional fund of $250,000, for the furtherance of research in science and engineering, or for the advancement in any other manner of the profession of engineering and the good of mankind."

Mr. Swasey, born at Exeter, New Hampshire, nearly 85 years ago, is the surviving member of the firm of Warner & Swasey of Cleveland, Ohio, famous for the building of great telescopes, and of instruments and machine tools of precision. The Engineering Foundation was founded in 1914 on the basis of his conception of a research instrumentality for the profession of engineering and for broad services to mankind. It was established by the national societies of Civil, Mining and Metallurgical, Mechanical and Electrical Engineers.

THE NEW YORK CENTRAL lines have instituted a table d'hote breakfast in all diners, in addition to the usual a la carte service.

Equipment and Supplies

LOCOMOTIVES

THE STANDARD FRUIT RAILROAD COMPANY, LaCeiba, Honduras, has ordered through the Equitable Equipment Company, Inc., one locomotive of the 2-8-0 type from the American Locomotive Company. This locomotive will have 17 in. by 22 in. cylinders and a total weight in working order of 102,000 lb.

FREIGHT CARS

THE CHICAGO & ILLINOIS MIDLAND has ordered four caboose cars from the Pullman Car & Manufacturing Corporation.

THE UNION TANK CAR COMPANY has ordered 100 tanks for tank cars of 6,500 gal. capacity, from the Graver Tank & Manufacturing Corporation.

THE NAVY DEPARTMENT OF THE UNITED STATES GOVERNMENT has ordered 6 helium tank cars from the General American Tank Car Corporation. Inquiry for this equipment was reported in the *Railway Age* of June 13.

PASSENGER CARS

THE MISSOURI PACIFIC has placed an order with the St. Louis Car Company for two 75-ft. gas-electric rail motor cars, which will be powered with 400-hp. power plants to be supplied by the Electro-Motive Company.

MOTOR COACHES

THE READING TRANSPORTATION COMPANY, subsidiary of the Reading, has purchased a 33-passenger observation Yellow coach from the General Motors Truck Company.

THE NEW ENGLAND TRANSPORTATION COMPANY, subsidiary of the New York, New Haven & Hartford, has purchased three Type 250, 33-passenger observation Yellow coaches from the General Motors Truck Company.

FOUR OF THE OPERATING COMPANIES of the Greyhound System have purchased additional equipment from the General Motors Truck Company. Twenty-one Type 250, 33-passenger observation Yellow coaches have been delivered to the Eastern Greyhound Lines, 12 of the same type to the Pennsylvania Greyhound Lines, 6 Type Z, 29-passenger observation Yellow coaches to the Southland Greyhound Lines, and 7 Type V, 29-passenger observation Yellow coaches to the Capitol Greyhound Lines.

IRON & STEEL

THE CHESAPEAKE & OHIO has ordered 900 tons of steel for a bridge at Fort Spring, W. Va., from the American Bridge Company.

THE LOUISVILLE & NASHVILLE has ordered 3,100 tons of structural steel for a bridge at Danville, Tenn., from the Virginia Bridge & Iron Company.

THE CHICAGO & NORTH WESTERN has ordered 300 tons of structural steel for a grade separation structure at Kenosha, Wis., from the Worden-Allen Company, Milwaukee, Wis.

THE ATCHISON, TOPEKA & SANTA FE has ordered 100 tons of structural steel for extensions to crane runways at Chicago from the McClintic-Marshall Corporation.

THE NORFOLK & WESTERN has placed orders for 20,000 tons of steel rail; 15,000 tons from the Carnegie Steel Company and 5,000 tons from the Bethlehem Steel Company.

THE NEW YORK CENTRAL has ordered 230 tons of steel for grade crossing elimination work at Purdys Crossing, N. Y., from the Harris Structural Steel Company. An order for 115 tons for a bridge at Canton, N. Y., has been given to the Shoemaker Bridge Company.

Foreign

Agreement With Railways on London Transport

Agreement between the Minister of Transport and the four principal British railways has been reached in connection with the bill pending in Parliament to create the London Passenger Transport Board to take over all passenger services in the London metropolitan area. This bill contemplates that the London Board will operate all traction services in London, including subways, surface lines and buses. The agreement with the railroad companies relates to all suburban services and provides that revenues of these shall be pooled with revenues of the services operated by the London Board, the pool to be divided among the Board and the railways in proportion to their ascertained receipts from the traffic involved during a standard year to be selected. The suburban lines of the railways comprise 900 miles of route which serve 600 stations and produce about £10,000,000 per year in passenger revenues; they are an important and integral part of London's travel facilities.

The agreement further provides that a joint committee representing the London Passenger Transport Board and the railways will be created for the settlement of all matters in common interest. Also, the London Traffic Advisory Committee, instituted in 1924 to advise the Minister of Transport on questions concerning metropolitan transport facilities, will be re-organized to include two members of the proposed London Passenger Transport Board and two members representing the railways.

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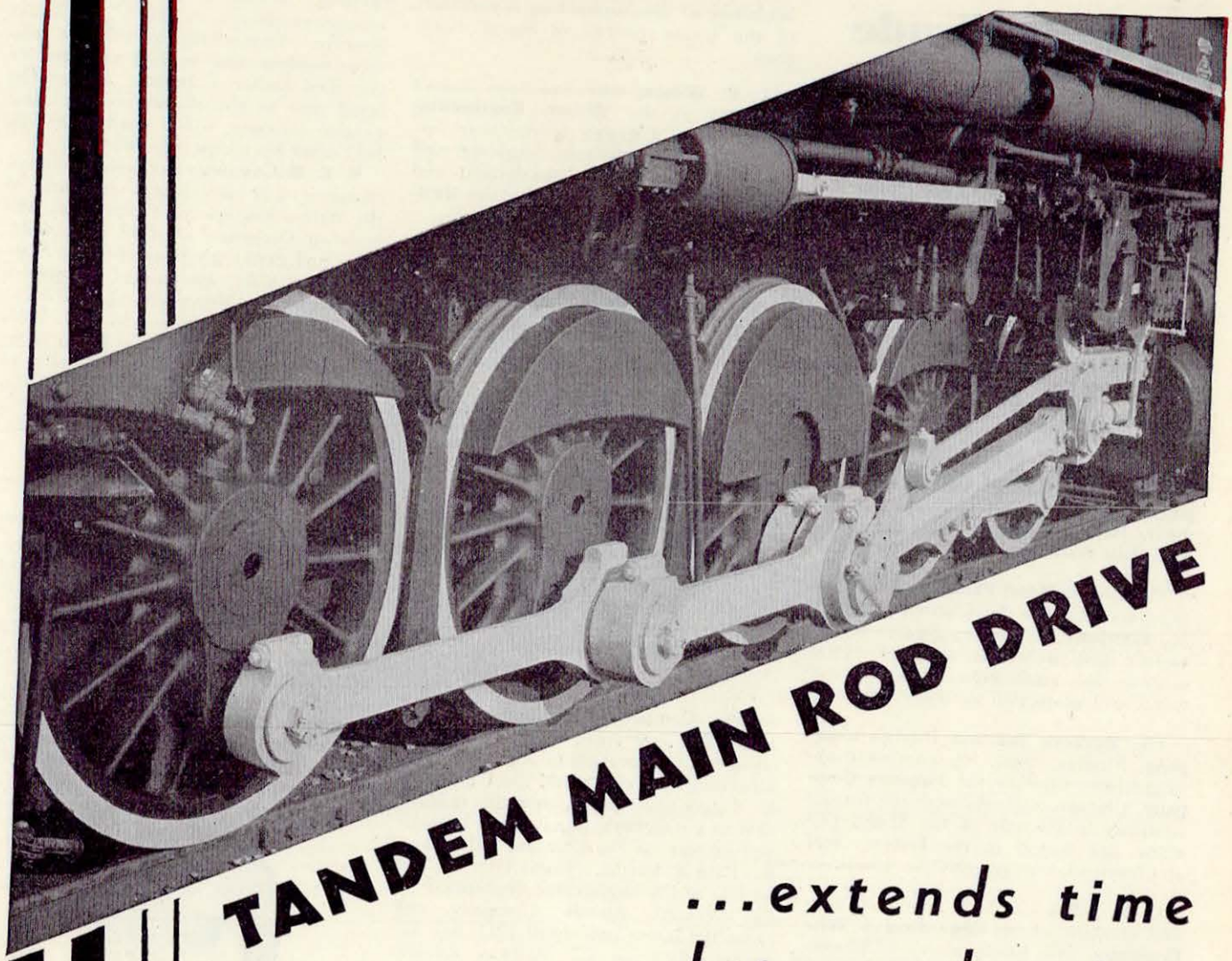


TANDEM MAIN ROD DRIVE

...extends time between shoppings

TANDEM MAIN ROD DRIVE saves a lot of wear and tear on rod bushings.

The distribution of piston thrust over four main outside crank pins naturally reduces bearing pressures.

The experience of one road where a certain class of locomotive contains some with and some without shows the striking maintenance economies of the Tandem Main Rod Drive.

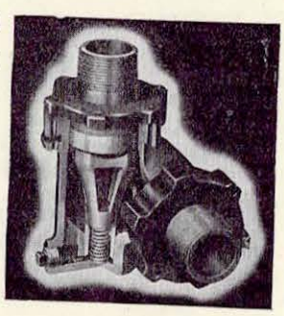
Locomotives so equipped are running for many months after the others have been shopped for rod and driving box work.

Tandem Main Rod Drive is needed to handle the power generated by modern Super-Power. On any locomotive, its use is justified by safety and the lowered rod maintenance that results.

THE FRANKLIN SLEEVE JOINT

•

Saves gaskets and *lowers maintenance*



FRANKLIN RAILWAY SUPPLY COMPANY

Incorporated

NEW YORK ST. LOUIS CHICAGO
SAN FRANCISCO MONTREAL

Supply Trade

H. W. Kelsey, general sales manager of the **Russell Manufacturing Company,** Middletown, Conn., has been promoted to take charge of all purchases of his company.

Nicholas Gerten, formerly vice-president of the **Blaw-Knox International Corporation,** New York, has been elected president of that organization.

W. F. Bauer, railway supply manufacturers' representative has moved his offices from 205 West Wacker drive, Chicago, to 38 South Dearborn street in the same city.

Ellsworth L. Mills, formerly sales manager of the **Bastian-Blessing Company,** Chicago, makers of welding equipment, has been elected vice-president. Mr. Mills continues in charge of sales.

The Liquid Metal Products, Inc., Chicago, has licensed the **Charles R. Long, Jr., Company,** Louisville, Ky., to manufacture and distribute a liquid metal coating for application to galvanized metal as a protection against corrosion.

The **Buckeye Traction Ditcher Company,** Findlay, Ohio, has concluded arrangements whereby the **Hopkins Company,** Chicago, will represent the former company in the sale of the Model OB crane and shovel in the railway field at Cleveland, Chicago and St. Louis.

C. N. Johns has been appointed general manager of the **Page Steel & Wire Company,** with headquarters at Monessen, Pa., and **W. H. Bleecker, Jr.,** has been appointed sales manager, with headquarters at 701 American Bank building, Pittsburgh.

Ralph M. Hoffman, for eight years manager of the Seattle office of the Pacific division of the **Link-Belt Company,** has been appointed vice-president and sales manager of that division, with headquarters at San Francisco, Cal. He succeeds **Harold H. Clark** who retired on June 1.

E. G. Grace, president of the **Bethlehem Steel Corporation,** has announced that an agreement has been made for the acquisition by Bethlehem of the properties and business of **Kalman Steel Company,** subject to the approval of the stockholders of the latter. Kalman Steel Company is a large fabricator and distributor of reinforcing steel, with warehouses in various cities in the Eastern and Middle Western districts.

Personal and business associates of **John Pressley Coleman,** consulting engineer of the Union Switch & Signal Co., Swissvale, Pa., gathered recently at Pittsburgh, Pa., to observe his completion of 50 years of service with that company. Mr. Coleman at the age of 16 years was employed as a draftsman by George Westinghouse. This was the beginning of the engineering department of the Union Switch & Signal Company.

L. F. Wilson, who has been elected president of the **Wilson Engineering Corporation,** Chicago, a company organized to manufacture, engineer and market the mechanical equipment and devices heretofore handled by the **Bird-Archer Company,** was born at Rush Lake, Wis., on November 4, 1883, and received his education at Ripon College, Lawrence University and the University of Wisconsin. He entered the railroad field as a telegraph operator and locomotive fireman on the Chicago, Milwaukee, St. Paul & Pacific. From 1906 to 1909 he was in the engineering department of the Western Electric Company, and from the latter date until 1911 was assistant editor of the Railway Review (now combined with the *Railway Age*) and for the following three years was editor of the Railway Master Mechanic (now combined with the Railway Mechanical Engineer). In 1914 he was appointed district manager of the Bird-Archer Company, which position he held until 1919. During the year 1917-18 he was also captain in the Quartermaster Corps of the U. S. Army, and from 1918 to 1926 was a major in the engineering division. In 1926 he was appointed lieutenant-commander of the U. S. Naval Reserve. From 1919 to 1928 he was vice-president and general manager of the Bird-Archer Company, and in the latter year he was elected president and general manager, which position he has held until his recent appointment.

L. F. Wilson

V. E. McCoy

V. E. McCoy, who has been appointed treasurer and mechanical engineer of the Wilson Engineering Corporation, was born on December 17, 1900, at Lincoln, Neb., and graduated from Montana State College in 1925. He entered the service of the Chicago, Milwaukee, St. Paul & Pacific as special apprentice in July, 1925, and served as combustion engineer from 1928 to 1929. In January, 1930, he was made assistant to the president of the Bird-Archer Company, which position he has held until his recent appointment.

OBITUARY

William N. Thornburgh, president and treasurer of the William N. Thornburgh Manufacturing Company, Cicero, Ill., who died on June 18, had been engaged in railway service and manufacturing for 44 years. He was born at Cleveland, Ohio, on September 15, 1866, and obtained his first railway experience in 1887 as a telegraph operator on the Baltimore & Ohio. Later he served as a chief clerk in the traffic department of that railroad, where he remained until he became manager and treasurer of the Thornburgh Coupler & Attachments, Ltd., Detroit, Mich. He then organized the Thornburgh Draft Gear Company, following which he established the William N. Thornburgh Manufacturing Company for the manufacture of dust guards for railroad journal boxes. Mr. Thornburgh's widow, Mrs. M. M. Thornburgh will continue the operation of the company.

William N. Thornburgh

Arthur Latham Church, mechanical engineer, secretary and assistant treasurer of the Baldwin Locomotive Works, Philadelphia, Pa., who died on June 25, was born on October 11, 1858, at Philadelphia, and was graduated with the degree of B. S. from the University of Pennsylvania in 1878. His engineering

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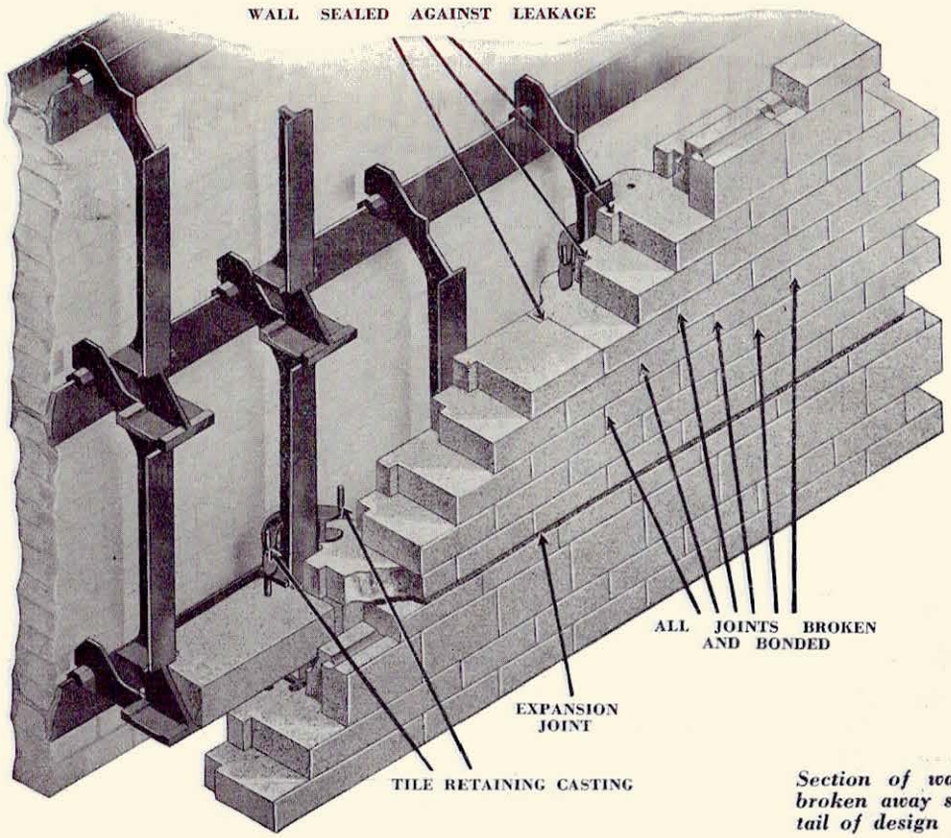

WALL SEALED AGAINST LEAKAGE
ALL JOINTS BROKEN AND BONDED
EXPANSION JOINT
TILE RETAINING CASTING
Section of wall partly broken away shows detail of design

American sectionally supported air-cooled wall

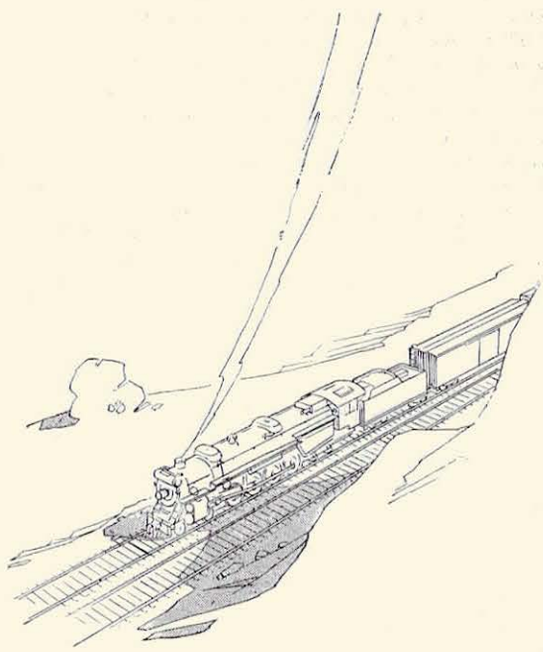
A RAILROAD VETERAN

. . . Now Serves All Industry

THE BROAD EXPERIENCE and knowledge of combustion that gained for the American Arch Company its outstanding position on the railroads has also been applied to general industrial problems.

American Arch Company suspended furnace roofs are in every leading steel plant in the country. Oil still Arches and air-cooled side walls by American Arch Company are used in the largest oil refineries. Many prominent power plants have sectionally supported side walls and Arches designed by American Arch Company.

The combustion experience that American Arch Company has made available to the railroads for 21 years, is now serving all industry.



AMERICAN ARCH COMPANY

Incorporated

New York Chicago

career began in 1878 in the machine shop and drafting room of the William Cramp & Sons Ship & Engine Building Company, Philadelphia. He was later connected with the engine departments of the steamships Queen of the Pacific, City of Peking and Granada and as draftsman of the Union Iron Works, San Francisco, Cal. He went to the Baldwin Locomotive Works in 1886, and at the time of his death was secretary and assistant treasurer. Mr. Church was a member of a number of technical and other associations and was the author of a book on the Training of a Secretary.

Joshua A. Hatfield, president of the American Bridge Company, died on July 4 at the Presbyterian Hospital, New York, after an illness of one week. Mr. Hatfield was born on June 11, 1863, at Philadelphia, Pa. He received his early education at private schools and from tutors and was graduated from the Hill School at Pottstown, Pa., in 1880. The same year he entered the employ of the Pottstown Iron Company where

Joshua A. Hatfield

he remained for 16 years, during the last five of which he held the position of general sales agent. From 1896 to May, 1900, he was associated as an executive with the A. & P. Roberts Company, Pencoyd Iron Works, Philadelphia, and in 1900 was appointed assistant to the president of the American Bridge Company. Mr. Hatfield had served as a director of the American Bridge Company since 1900 and until 1914 was president of the American Bridge Company of New York, which was consolidated with the American Bridge Company of New Jersey, the present company, of which Mr. Hatfield became vice-president and was elected president in April 1927.

TRADE PUBLICATION

CARBON PILE REGULATORS.—Regulation of voltage, current and speed control is explained in an 18-page illustrated booklet recently issued by the Safety Car Heating & Lighting Company, New York. In addition to the use of Regulators in connection with carlighting equipment, numerous other applications are indicated in the railroad, marine and industrial field.

Construction

ATCHISON, TOPEKA & SANTA FE.—A contract has been awarded to the Sharpe & Fellows Construction Company, Los Angeles, Cal., for the construction of a branch line from Loving, N. M., to a point five miles east, to serve a refinery to be built by the United States Potash Company, Inc. A contract has also been awarded to this company for the construction of a six-stall brick enginehouse with a boiler room annex at Boise City, Okla.

CHESAPEAKE & OHIO.—Bids were received by this company on July 2 for the construction of an undergrade crossing, to cost approximately $62,150, at South Charleston, W. Va., and on July 6 for the enlargement and relining of Kelly's tunnel, Jerrys Run, Va., work which is estimated to cost $190,000. Authority has been issued for the construction at Bellevue, Ky., of an undergrade crossing to cost about $100,000, and for the waterproofing, at an estimated cost of $44,600, of 21 bridges between Marshall, Ohio, and Columbus, while a contract amounting to $29,000 has been awarded to Boxley Bros. Company, Orange, Va., for the construction of an overhead crossing at Staunton, Va., authorization for which was reported in the *Railway Age* of March 28.

GULF & WEST TEXAS.—This company has applied to the Interstate Commerce Commission for a certificate authorizing the construction of an extension from a connection with the San Antonio & Aransas Pass where it crosses the Guadalupe river to Fredericksburg, Tex., 28.6 miles.

LONG ISLAND.—The Carmon Mill Road crossing of this company's tracks, just west of Amityville station, Oyster Bay, N. Y., has been designated for elimination by the New York Public Service Commission. Present plans contemplate carrying the highway under the railroad at a point 320 ft. west of the existing crossing at an estimated cost of $188,900.

MISSOURI PACIFIC.—A contract has been awarded by the United States Engineer office at Memphis, Tenn., to J. W. Hendrix, Portageville, Mo., for the construction of a reinforced concrete culvert to carry the intercepting drainage ditch of the Birds' Point-New Madrid floodway system under this railroad's tracks at Samos, Mo.

MONTGOMERY COMPANY.—The Mexican government has granted a concession to Eugene LeBaron, representing this company, for the construction of an industrial railroad in the State of Jalisco, Mexico, from Boca de los Tomates, on Banderas bay, along the Ameca river to Las Palmas. Construction must be undertaken by August 1, and the concession terminates in 60 years.

NEW YORK CENTRAL.—This company has recently awarded a number of contracts, as follows: To the George W. Rogers Construction Corporation, New York, construction of bulkhead and platforms from Pier B to Pier F, Sixtieth Street terminal, New York City; to the Edward J. Duffy Company, Inc., New York, construction of a freight house at Newark avenue, Jersey City, N. J.; to the Arthur McMullen Company, New York, placing of column foundations and abutments for a viaduct on the West Side of New York City; to the Bates & Rogers Construction Company, New York, elimination of a grade crossing at Cemetery road, Canton, N. Y., and to the Walsh Construction Company, Syracuse, N. Y., grading for a coach yard at Peat street, Syracuse, and elimination of a grade crossing at Main street, Savannah, N. Y.

NORFOLK & WESTERN.—In connection with the building of Watkins yard, near Columbus, this company has issued authority for the construction, at a cost of about $175,000, of a new underpass to eliminate a grade crossing at Refugee road, between Valley Crossing and Bannon, Ohio.

READING.—In connection with an extensive program of grade separation involving the elimination of street and highway crossings between a point about 1,000 ft. south of Wister street and Bethlehem pike, on its Germantown & Chestnut Hill branch in and near Philadelphia, Pa., this company has awarded the following contracts: Contract No. 7—Inspection of metal work for bridges and other structures between Wister and Haines streets, to the Pittsburgh Testing Laboratory, Philadelphia; Contract No. 9—Grading, masonry, trestle, embankment and other work appurtenant to the general grade separation project, from a point south of Wister street to Haines street, to the James McGraw Company, Philadelphia; Contract No. 10—Steel superstructure for bridges between Wister and Musgrave streets, to the McClintic-Marshall Corporation, Bethlehem, Pa., and Contract No. 11—Waterproofing of bridges between Wister and Musgrave streets, to Martin & Breen, Inc., Philadelphia. The entire project, which is being undertaken in connection with the electrification of the Reading's Philadelphia suburban lines, is to be completed early in 1933, by which time electric operation will be inaugurated on the Germantown & Chestnut Hill branch. In addition to the elimination of grade crossings, which will necessitate the raising of tracks, in some places as much as 21 ft., for a distance of about one and one-half miles, and the construction of bridges at Wister, Penn, Church, Armat, Baynton, Morton and Musgrave streets and Chelten avenue, the general project, as contemplated, also includes the straightening of tracks, the laying of new rail and the construction of new passenger and freight stations south of Chelten avenue.

The Reading has also awarded to William Steele & Sons Company, Philadelphia, a contract for the construction of a new passenger station at Jenkintown, Pa., as described in the *Railway Age* of April 4, page 697.

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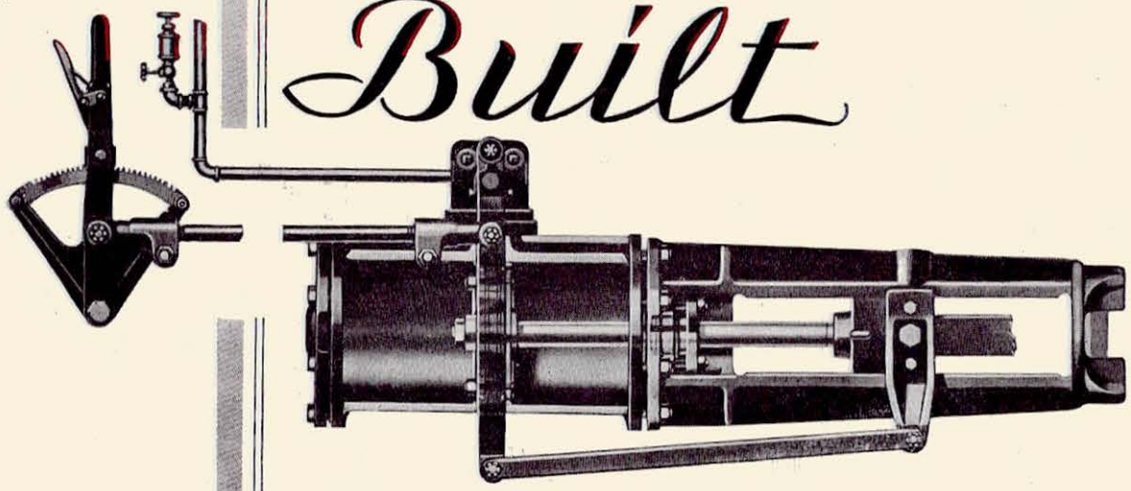
Alco Built



REVERSE gears are rapidly becoming recognized as essential equipment. But the growing demand for the Alco Reverse Gear in particular goes farther back than that.

To measure up to the needs of today for a fast, flexible and dependable gear for any service is the central idea around which Alco reverse gears are built. It serves acceptably in heavy freight service and responds equally well to the needs of high speed passenger requirements. Again, in fast freight, helper and switching service it gives quick and accurate valve gear adjustment.

With low initial cost, its simple and interchangeable construction eliminates expensive repair parts throughout a long service life.

In short, that extra measure of service which is inbuilt in every Alco product is fully embodied in Alco Reverse Gears.

American Locomotive Company

30 Church Street New York, N. Y.

Financial

COLORADO-KANSAS.—*Receiver Appointed.*—Ward S. Arnold of Denver, Colo., has been appointed receiver of this railroad by District Judge John H. Voorhees at Pueblo, Colo. The receivership was instituted as the result of a suit filed against the railroad by Robert K. Johnson, Oklahoma City, Okla., to satisfy an unpaid note of $4,000. The railroad extends between Pueblo and Stone City, 22 miles.

DELAWARE, LACKAWANNA & WESTERN.—*Bonds.*—This company and the New York, Lackawanna & Western have applied to the Interstate Commerce Commission for authority to reduce the rate of interest on $13,639,000 of first and refunding mortgage bonds of the latter company held in the treasury of the Lackawanna from 5 per cent to 4 or 4½ per cent and for the Lackawanna to sell the bonds to provide funds for the purpose of retiring bank loans amounting to $7,400,000 and paying rentals, taxes, etc.

GEORGIA, SOUTHWESTERN & GULF.—*Notes.*—The Interstate Commerce Commission has authorized this company to issue $30,000 of promissory notes to bear interest at not more than 8 per cent and to mature in not more than two years.

LOUISVILLE & NASHVILLE.—*Bonds.*—This company has applied to the Interstate Commerce Commission for authority for the authentication and delivery of $8,881,000 of first and refunding mortgage 4½ per cent bonds, to reimburse its treasury, to be held in the treasury subject to further order of the commission so that the company may be in a position to issue the bonds rapidly in connection with plans for the development of the property.

MISSOURI & NORTH ARKANSAS.—*Receiver's Certificates.*—The receiver has applied to the Interstate Commerce Commission for authority to issue $700,000 of receiver's certificates to retire $600,000 of maturing certificates and to provide for the continued operation of the property.

NEW ORLEANS, TEXAS & MEXICO.—*Acquisition.*—The Interstate Commerce Commission has authorized this company to acquire control of the Rio Grande & Eagle Pass, which has a line from Laredo to Darwin, Tex., by purchase of its capital stock for $337,500, on condition that through routes and joint rates applying to the movement of fruits and vegetables from points served by the Eagle Pass and the Texas-Mexican to destinations east of the Mississippi river shall be maintained.

NEW YORK CENTRAL.—*Abandonment.*—The Interstate Commerce Commission has authorized this company to abandon its Hinckley branch extending from Prospect Junction, N. Y., to Hinckley 2.8 miles.

NORTHERN PACIFIC.—*Acquisition.*—This company, the Oregon-Washington Railroad & Navigation Company, the Great Northern and the Chicago, Milwaukee, St. Paul & Pacific, respectively, have been authorized to acquire and operate undivided one-fourth interests in that part of the Longview, Portland & Northern extending from Longview Junction, Wash., along the west bank of the Cowlitz River to Vader Junction, Wash., 24.5 miles. The three companies first mentioned applied for authority to acquire and operate this line and the Chicago, Milwaukee, St. Paul & Pacific appeared in the case as an intervener asking authority to participate in the acquisition and also to operate under trackage rights over the Northern Pacific from Chehalis to Longview Junction, 20 miles, or, as an alternative, to construct an extension of its line from Chehalis, Wash., to Vader Junction. The Commission has directed that the record be kept open to allow the C.M.St.P. & P. to negotiate for trackage rights with the Northern Pacific, failing which the Commission indicates its willingness to authorize the company to construct its own line.

PORTLAND TERMINAL.—*Securities.*—The Interstate Commerce Commission has authorized this company to issue $1,050,000 of 5 per cent, first mortgage bonds and, in the event the bonds are not sold before August 5, to issue an equal amount of notes, the bonds to be sold at not less than 96½ or the notes to be sold at not less than their face amount. Authority is granted to the Maine Central to assume obligation and liability as guarantor in respect of the bonds and notes.

ST. LOUIS-SAN FRANCISCO.—*Bonds.*—The Interstate Commerce Commission has authorized this company to issue $13,228,100 of prior lien mortgage 6 per cent bonds, series E, to be pledged with the trustee of road's consolidated mortgage—this issue being conditional upon the surrender of $3,886,100 of prior lien mortgage 5 per cent, series B, bonds for cancellation. Upon pledge of the prior lien bonds and upon surrender of $6,900,000 of consolidated mortgage 4½ per cent, series A, bonds for cancellation, the road is authorized to issue $16,242,000 of consolidated mortgage 6 per cent bonds, series B, these bonds to be pledged and repledged from time to time as security for notes. As an alternative to this latter, the road is authorized to sell $10,000,000 of this issue at not less than 93.34, applying the proceeds in payment of $9,342,000 of maturing general mortgage bonds, and the remaining $6,242,000 to be pledged as security for notes. The company is also authorized to issue from time to time $16,242,000 of consolidated mortgage 6 per cent bonds, series B, in exchange for an equal amount of consolidated mortgage 6 per cent bonds, series B, presented for conversion.

TWIN CITY RAILROAD.—*Operation.*—The Interstate Commerce Commission has denied the application of this electric line to operate in interstate commerce between Chehalis, Wash., and Centralia, 5 miles.

Average Prices of Stocks and of Bonds

	July 7	Last week	Last year
Average price of 20 representative railway stocks..	70.02	72.92	111.53
Average price of 20 representative railway bonds..	91.91	91.22	94.09

Railway Officers

EXECUTIVE

J. F. Griswold has been elected vice-president of the Helena Southwestern, with headquarters at Chicago.

W. R. Lence, general manager of the Abilene & Southern, has been elected vice-president and general manager, with headquarters as before at Abilene, Tex.

The headquarters of **H. B. McBride,** vice-president, auditor and assistant treasurer of the Cowlitz, Chehalis & Cascade, have been removed from Chehalis, Wash., to Seattle.

H. E. Dodge, secretary and treasurer of the Magma Arizona, has been elected vice-president, with headquarters as before at New York. **D. E. Thomas** succeeds Mr. Dodge as secretary and treasurer.

T. J. Maloney, general manager of the Chicago, West Pullman & Southern, with headquarters at Chicago, has been elected president and general manager, with the same headquarters. **J. E. Ryan,** auditor, has been elected vice-president and auditor, with headquarters as before at Chicago.

M. H. Cahill, president of the Missouri-Kansas-Texas, **H. E. McGee,** executive vice-president, **F. W. Grace,** vice-president and general manager, **N. A. Phillips,** secretary, and **Frank Johnson,** treasurer, have also been elected to similar positions on the Beaver, Meade & Englewood.

George Francis Brownell, vice-president and general counsel of the Erie and its affiliated lines, with headquarters in New York, has retired from active service under the retirement rules of the company, having reached the age of 70. He has been appointed vice-president and advisory counsel by the board of directors in order that "the company may continue to have the benefit of his advice and counsel." Mr. Brownell was born at Des Moines, Iowa, on June 5, 1861. He was educated at Medina Academy, Medina, N. Y., and the Lockport, (N. Y.) Union school and was graduated from the University of Michigan in 1883 with an LL. B. degree, receiving a similar degree from the Albany Law School in 1892. He was admitted to the bar in 1882 and in the following year entered the service of the Erie. He became a member of the firm of Sprague, Marcy & Sprague, of Buffalo, N. Y., (now Moot, Sprague, Brownell, Marcy & Carr) in 1888. Mr. Brownell came to New York as general solicitor in charge of the Erie's legal department in 1897 and in January, 1904, he was appointed vice-president and general solicitor. He was appointed vice-president and general counsel in charge of the legal and financial departments in 1919, serving continuously in

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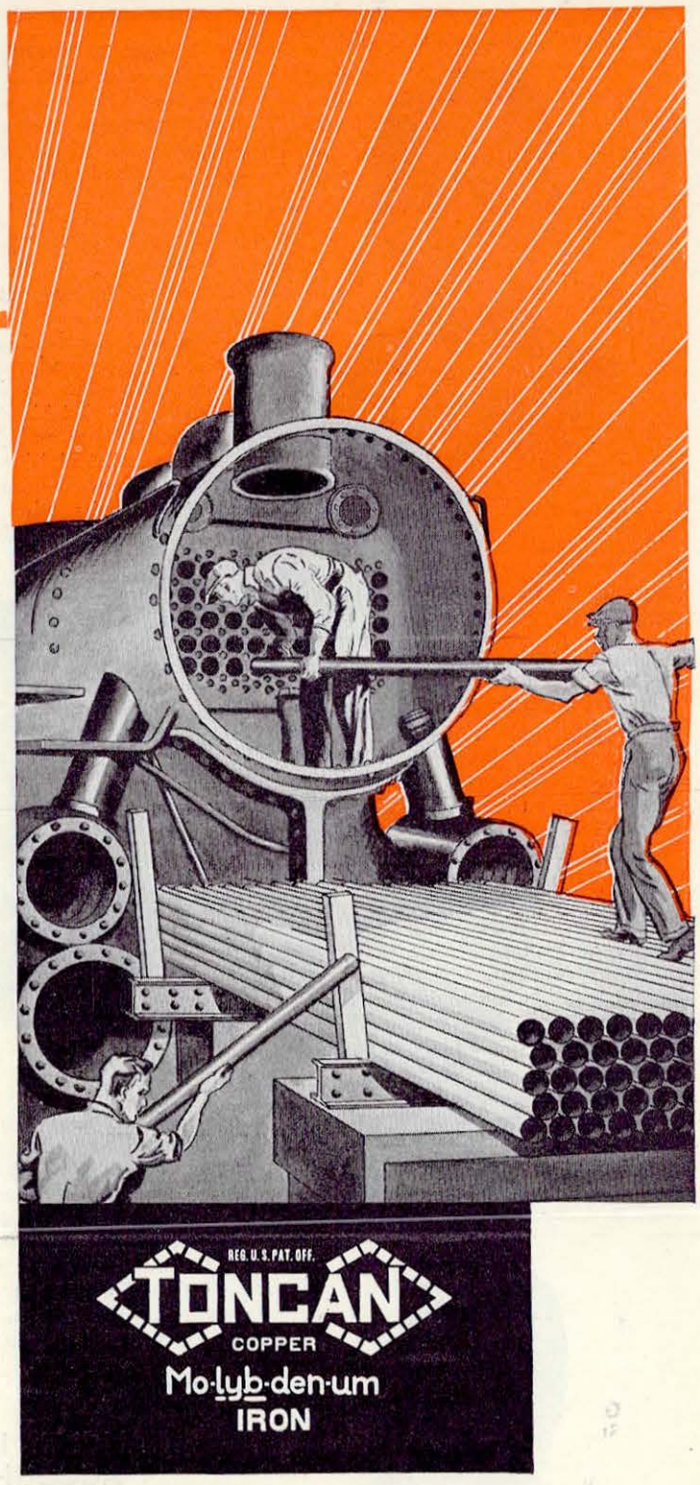
WHAT makes an ideal BOILER TUBE?



OF COURSE it must be seamless. And boiler tubes of Toncan Iron *are* seamless, in fact, the *only* seamless iron boiler tubes.

Then, the ideal boiler tube should work readily. Not only do tubes of Toncan Iron work easily but cold working does not affect their resistance to corrosion and to fire-cracking.

Finally, boiler tubes must give long service once they are in place. Here Toncan Iron excels. This alloy of refined iron, copper and molybdenum has greater corrosion resistance than any locomotive boiler tube material.

Seamless Toncan Iron boiler tubes have proven their desirability by years of service under many different conditions.

REPUBLIC STEEL CORPORATION

HEADQUARTERS: YOUNGSTOWN, OHIO

that capacity until his retirement. Mr. Brownell has been a member of the board of directors of the company since

George Francis Brownell

1915 and of its executive committee since 1916.

John M. Fitzgerald, assistant to the chairman of the Committee on Public Relations of the Eastern Railroads, has been appointed vice-chairman, with headquarters as before in New York. Mr. Fitzgerald was born near Philadelphia, Pa., on April 26, 1877. He was educated in the public schools and the Philadelphia School of Technology, and entered railway service in 1893 in the engineering department of the Columbus, Sandusky & Hocking (now part of the Pennsylvania). Since that time he has been engaged, successively, in the engineering, construction, maintenance and operating departments of the Choctaw, Oklahoma & Gulf (now part of the Chicago, Rock Island & Pacific); as assistant general manager of the Virginia & Southwestern (now part of the Southern); as vice-president of the Pittsburgh Terminal Railroad & Coal Company; as president of the Davis Coal & Coke Company; as vice-president and later as president of the Western Maryland, and as assistant to the chairman of the Committee on Public Relations, Eastern Presidents' Conference, in which capacity he served continuously until his recent appointment as vice-chairman of that committee.

John M. Fitzgerald

Donald R. MacBain, general manager of the New York Central, lines west of Buffalo, N. Y., has been appointed vice-president and general manager of those lines, with headquarters as before at Cleveland, Ohio. Mr. MacBain was born at Queenston, Ont., on October 23, 1861, and obtained his first railroad experience at the age of 15 years as a machinist apprentice on the Canada Southern (now part of the Michigan Central). Later he served that railroad and the Michigan Central successively as locomotive fireman and engineman, traveling engineer, master mechanic at Michigan City, Ind., St. Thomas, Ont., and Jackson, Michigan., and assistant division superintendent. In 1908, he was appointed assistant superintendent of motive power of the New York Central at Albany, N. Y., where

Donald R. MacBain

he remained until 1910, when he became superintendent of motive power of the Lake Shore & Michigan Southern (now part of the New York Central), at Cleveland. Mr. MacBain was promoted to assistant general manager of the New York Central lines west of Buffalo at Cleveland in 1919, and to general manager in 1926. His appointment as vice-president and general manager became effective on July 1.

FINANCIAL, LEGAL AND ACCOUNTING

I. R. Fisher has been appointed auditor of the Mississippi Eastern, with headquarters at Quitman, Miss.

H. L. Fogg has been appointed assistant secretary of the Litchfield & Madison, with headquarters at Chicago.

J. A. Simpson has been appointed assistant treasurer of the Northwestern Pacific, with headquarters at New York.

P. H. Lash, valuation auditor of the Chesapeake & Ohio, with headquarters at Richmond, Va., has been appointed assistant to the comptroller, with headquarters at Cleveland, Ohio.

J. D. Phelps, assistant treasurer of the Ft. Smith & Western, has been promoted to treasurer, with headquarters as before at Ft. Smith, Ark. **A. N. Sicard** succeeds Mr. Phelps as assistant treasurer.

Harry L. Kershner, cashier to the assistant treasurer of the Cleveland, Cincinnati, Chicago & St. Louis, has been promoted to assistant treasurer of that railroad, the Central Indiana and a number of other subsidiaries of the New York Central Lines, with headquarters at Cincinnati, Ohio. Mr. Kershner succeeds **Albert P. Burke,** who retired from active duty on July 1, after 44 years of railway service.

Herbert A. Taylor, general solicitor of the Erie and affiliated lines at New York, has been elected general counsel and head of the legal department to succeed **George F. Brownell,** who retired on July 1; **Marion B. Pierce,** general attorney, at New York, has been advanced to assistant general counsel; **Henry H. Hull,** general attorney, at New York, has been advanced to assistant general counsel; **Grover R. James,** assistant general solicitor at New York, has become general attorney and **Paca Oberlin,** assistant to vice-president, New York, becomes counsel.

OPERATING

F. J. Connelly has been appointed assistant to the general manager of the Northwestern Pacific, with headquarters at San Francisco, Cal., succeeding **H. G. Jenkins,** who has retired.

The Pan-American, National of Tehauntepec and Vera Cruz al Istmo divisions of the National of Mexico have been merged into one division to be known as the Southeast division.

J. A. Glen, superintendent of the Beaumont division of the Gulf, Colorado & Santa Fe, of Beaumont, Tex., has been promoted to assistant to the general manager, with the same headquarters.

M. J. Gruber, trainmaster of the Twin City Terminal division of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn., has been promoted to assistant superintendent of the Terre Haute division at Terre Haute, Ind. **W. J. Hotchkiss,** trainmaster at Savanna, Ill., has been transferred to the Twin City Terminal division at Minneapolis to succeed Mr. Gruber.

Frank H. Daggett, whose appointment as superintendent of the Northern division of the Bangor & Aroostook, with headquarters at Houlton, Me., was announced in the *Railway Age* of June 13, has been in the service of that road continuously since 1897. Mr. Daggett was born at Hodgdon, Me., on December 8, 1880. He began his railroad career as telegraph operator for the Bangor & Aroostook in April, 1897, later being appointed station agent. From October, 1906, to June, 1912, he served as train despatcher, and on the

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BETTER FIRES

FIREBAR CORPORATION
CLEVELAND OHIO.

latter date he was promoted to the position of chief train despatcher. Mr. Daggett was appointed superintendent of car service, with headquarters at Bangor, Me., in October, 1917, serving in that capacity until his recent appointment as superintendent of the Northern division, which became effective on May 20.

TRAFFIC

K. R. Kriebel has been appointed general agent for the Chicago, Springfield & St. Louis, at Cleveland, Ohio.

E. L. Bodge has been appointed general agent of the Litchfield & Madison, with headquarters at Kansas City, Mo.

W. E. Kennedy, foreign freight traffic manager of the Mobile & Ohio, with headquarters at Mobile, Ala., has been promoted to assistant freight traffic manager, with the same headquarters.

George C. Potter has been appointed general freight agent of the Danville & Western, the Carolina & Northwestern, the High Point, Randleman, Asheboro & Southern, the Blue Ridge Railway and the Yadkin Railroad Company, with headquarters at Atlanta, Ga., succeeding **C. B. Walker,** who has resigned.

H. E. Yerkes, traveling passenger agent of the Central of New Jersey, with headquarters at Wilkes-Barre, Pa., has been appointed assistant general passenger agent, with headquarters at New York, succeeding **Howard E. Simpson,** recently appointed general eastern passenger agent of the Baltimore & Ohio. **E. L. Tomlinson** will succeed Mr. Yerkes as traveling passenger agent at Wilkes-Barre.

The Missouri-Kansas-Texas, in order to give increased attention to specific classes of freight, has created three new positions with jurisdiction over perishable, grain and cotton traffic respectively. **C. L. Lyons,** executive general agent at Kansas City, Mo., has been appointed general perishable traffic representative, with headquarters at the same point. **William A. Springall,** division freight agent at Oklahoma City, Okla., has been appointed general grain traffic representative, with headquarters at that point. **B. A. Erwin** has been appointed general cotton traffic representative, with headquarters at Houston, Tex. **Columbus Haile, Jr.,** general freight agent at Kansas City, has been transferred to St. Louis, Mo.

C. F. Keller, who has been appointed general freight agent of the Lehigh & New England, with headquarters at Bethlehem, Pa., as announced in the *Railway Age* of July 4, first entered railroad service with the Erie in November, 1907. From that date until March, 1920, he served in various clerical and stenographic positions and was engaged in rate work in the operating department, also serving in minor positions in the secretary's office and the traffic department. He became office manager in the vice-president's office (traffic department) in March, 1920, and in January, 1925, was appointed coal freight agent for the Erie, serving in that position until his recent appointment as general freight agent for the Lehigh & New England, which became effective on July 1.

C. F. Keller

Howard E. Simpson, assistant general passenger agent of the Central of New Jersey at New York, has been appointed general eastern passenger agent for the Baltimore & Ohio, with headquarters in the Chanin building, New York. Mr. Simpson was born in Jersey City, N. J., on March 15, 1896. He entered the service of the Jersey Central in 1912 as clerk, serving in that capacity and in various minor positions until November, 1917. From the latter date until May, 1919, Mr. Simpson served in the United States Navy, then returning to the Jersey Central as purser on the steamer "Sandy Hook," operated by that road. He became rate clerk in 1920 and two years later was appointed city passenger agent at New York. From 1925 to 1926, Mr. Simpson was advertising agent and from January to May of the latter year he served as district passenger agent at Newark, N. J. From May to July, 1926, he was general eastern passenger agent at New York, and on the latter date was appointed assistant general passenger agent at the same point, in which position he served until his recent appointment as general eastern passenger agent of the Baltimore & Ohio.

Howard E. Simpson

ENGINEERING AND SIGNALING

The headquarters of **Heron Cabrera,** chief engineer of the National of Mexico, were transferred to Buenavista station, Mexico, D. F., on July 1.

J. S. McBride, valuation engineer of the Chicago & Eastern Illinois, has been promoted to chief engineer, with headquarters as before at Chicago, to succeed **L. C. Hartley,** who has retired on account of ill health.

Morris S. Blaiklock, assistant chief engineer of the Canadian National, with headquarters at Montreal, Que., has retired from the service of that road after more than half a century with the company. He will continue to act as chairman of the General Co-operative Committee of Maintenance of Way employees.

PURCHASES AND STORES

R. E. Simmons, storekeeper on the Louisiana & Arkansas, with headquarters at Shreveport, La., has been transferred to Minden, La.

J. F. Hibbard, stationer of the Kansas City Southern, with headquarters at Kansas City, Mo., has retired from active duty after 28 years of service with that company, 20 years of which were spent as stationer.

SPECIAL

George D. Moffett, industrial commissioner of the Pere Marquette, with headquarters at Detroit, Mich., has also been appointed industrial commissioner of the Chesapeake & Ohio. Mr. Moffett succeeds **K. T. Crawley,** who has been appointed special representative of the development department of the C. & O., with headquarters as before at Richmond, Va. **C. H. Slayman,** industrial engineer of the Pere Marquette, has been promoted to assistant industrial commissioner of that railroad, with headquarters as before at Detroit.

OBITUARY

Wilson E. Symons, successively superintendent of motive power and equipment of the Plant System (now the Atlantic Coast Line), mechanical superintendent of the Gulf, Colorado & Santa Fe and superintendent of machinery of the Kansas City Southern from 1898 to 1905, died on May 1, at the age of 72 years. At the time of his retirement from active duty in 1905, Mr. Symons had spent 45 years in railway service.

Annual Report

Annual Report of the New York Central Railroad Company

To the Stockholders of

THE NEW YORK CENTRAL RAILROAD COMPANY:

The Board of Directors herewith submits its report for the year ended December 31, 1930, with statements showing the income account and the financial condition of the company.

Leases of Lines of Controlled Companies

Under indentures dated January 2, 1930, effective February 1, 1930, the company leased for 99 years the lines and properties of The Cleveland Cincinnati Chicago and St. Louis Railway Company, The Michigan Central Railroad Company, the Chicago Kalamazoo and Saginaw Railway Company and the lessor companies' leased lines, including in the case of The Cleveland Cincinnati Chicago and St. Louis Railway Company the lines and properties which by similar indentures for like terms had been leased to it by The Cincinnati Northern Railroad Company and Evansville Indianapolis and Terre Haute Railway Company.

The additional mileage acquired by the company for operation under these leases, stated as of December 31, 1929, is as follows:

Road	Owned miles	Leased miles	Trackage (Inter-company mileage eliminated) miles	Total miles
C. C. C. & St. L. Ry.	1,698.17	529.81	119.59	2,347.57
Michigan Central R. R.	1,182.56	576.43	60.52	1,819.51
C. K. & S. Ry.	45.91	.....	.....	45.91
Cincinnati Northern R. R.	205.14	.....	.....	205.14
E. I. & T. H. Ry.	139.01	.....	3.50	142.51
Totals	3,270.79	1,106.24	183.61	4,560.64

The total mileage operated by the company at the end of the year compared with the same lines stated as of December 31, 1929, was as follows:

	1930 Miles	1929 Miles	Increase Miles	Decrease Miles
Main line and branches	3,731.52	3,727.05	4.47	
Leased lines and lines operated under contract	6,963.78	7,031.82		68.04
Trackage rights	726.25	726.31		.06
Totals	11,421.55	11,485.18		63.63

Of the increase of 4.47 miles of main line and branches, .27 mile resulted from change of line at Mott Haven Junction, and 4.25 miles from construction of the St. Joseph Lead Branch, Emeryville to Balmat, N. Y., and there was a reduction of .05 mile due to remeasurements and adjustments.

The decrease of 68.04 miles of leased lines is accounted for as follows: there was a decrease of 58.73 miles, resulting from reclassification of first main track as second and third tracks, principally by reason of the parallelism of the Toledo-Detroit lines of this company and The Michigan Central Railroad Company, a decrease of 4.01 miles caused by relocation of West Shore Railroad tracks at Syracuse, a decrease of 5.34 miles incident to the abandonment of tracks of the West Shore Railroad at Utica and Syracuse, formerly used in connection with the operation of the New York State Railways between those points, and there was an increase of .04 mile due to remeasurements and adjustments.

Miles operated under trackage rights decreased .06 mile as the result of sundry remeasurements and adjustments.

Restatement of Accounts for January, 1930, to Reflect Lease Basis for Entire Year—Comparisons with 1929

For the purpose of comparisons on an annual basis, the figures for the lines leased as of February 1, 1930, have been included for the entire year 1930 in making up the income account as it is set forth on page 6 and in statements of tonnage and traffic. For the same reason, where comparisons with the year 1929 are shown the figures for that year for the leased lines referred to have been included.

The Year's Business

The general recession in business which commenced in the latter part of 1929 and which continued throughout 1930 is reflected in the heavy decrease as compared with 1929, in freight and passenger traffic and the revenues therefrom. Operating revenues were $478,918,347.55, a decrease of $111,090,275.99.

Revenue freight amounted to 150,046,279 tons, a decrease of 53,146,925 tons (26.16%), the revenue therefrom being $307,177,575.29, a decrease of $74,803,799.89 (19.58%).

As shown by the appended statement of commodities handled, decreases in tonnage were general throughout the list, there having been only a few increases and these of relatively minor importance. Some of the commodities in which major decreases took place, with accompanying serious losses in revenue, are listed in the following table:

Commodities	Tons	Decrease	Revenue	Decrease
Automobiles and auto-trucks, tires, accessories, etc.	1,916,309	2,065,514	$15,086,076	$12,890,802
Bituminous coal	59,449,342	21,744,844	67,003,287	11,179,215
Iron and steel, rated 5th class, N. O. S.	3,652,593	2,626,914	10,750,080	6,221,327
Lumber, shingles and lath.	2,414,941	2,247,862	5,750,235	3,897,755
Products of mines—other.	3,781,331	2,199,097	4,277,203	1,914,633
Iron ore	4,944,058	2,174,238	2,618,559	1,298,661
Gravel, sand and crushed stone	7,836,598	2,807,957	5,478,424	1,947,654
Machinery and boilers	704,725	367,657	3,043,965	1,028,970
Scrap iron and scrap steel.	971,875	761,602	1,646,623	1,028,693

The company carried 72,951,015 revenue passengers, a decrease of 6,264,077, these losses being distributed: interline passengers 2,816,809, local passengers 2,665,520, and commutation passengers 781,748. Comparison with interline and local passengers carried in 1929 is, however, affected by the fact that for 1930 all passengers traveling between points on the lines operated by the company are classified as local, while for 1929 passengers traveling between points on the New York Central Railroad and points on lines leased by the company in 1930 were classified as interline passengers. The revenue received from passenger business amounted to $111,184,744.82, a decrease of $19,877,511.80.

Net railway operating income was $57,235,527.37, a decrease of $46,467,252.38. Net income amounted to $35,981,791.87, a decrease of $41,446,791.90, the decrease in net railway operating income being partly offset by an increase of $5,594,969.32 in non-operating income.

Income Account for the Year

Including Boston & Albany Railroad, Ohio Central Lines, Michigan Central Lines, and Big Four Lines. (Results for January, 1930, as to the roads covered by the leases effective February 1, 1930, are included for purposes of comparison. Figures for 1929 have been revised by including the figures for roads covered by leases effective February 1, 1930)

	Year ended Dec. 31, 1930	Year ended Dec. 31, 1929	+Increase or —Decrease
OPERATING INCOME			
RAILWAY OPERATIONS	11,421.55 *miles operated*	11,485.18 *miles operated*	—63.63 *miles*
Railway operating revenues	$478,918,347.55	$590,008,623.54	—$111,090,275.99
Railway operating expenses	376,729,417.97	441,245,593.33	— 64,516,175.36
NET REVENUE FROM RAILWAY OPERATIONS	$102,188,929.58	$148,763,030.21	— $46,574,100.63
Percentage of expenses to revenues	(78.66)	(74.78)	+ (3.88)
Railway tax accruals	$34,009,020.80	$39,769,413.55	— $5,760,392.75
Uncollectible railway revenues	125,750.30	135,687.82	— 9,937.52
RAILWAY OPERATING INCOME	$68,054,158.48	$108,857,928.84	— $40,803,770.36
Equipment rents, net debit	$10,288,151.34	$6,749,251.41	+ $3,538,899.93
Joint facility rents, net debit	530,479.77	Cr 1,594,102.32	+ 2,124,582.09
NET RAILWAY OPERATING INCOME	$57,235,527.37	$103,702,779.75	— $46,467,252.38
MISCELLANEOUS OPERATIONS			
Revenues	$999,418.80	$1,111,025.30	— $111,606.50
Expenses and taxes	963,296.74	1,068,358.55	— 105,061.81
MISCELLANEOUS OPERATING INCOME	$36,122.06	$42,666.75	— $6,544.69
TOTAL OPERATING INCOME	$57,271,649.43	$103,745,446.50	— $46,473,797.07

[ADVERTISEMENT]

	Year ended Dec. 31, 1930	Year ended Dec. 31, 1929	+Increase or —Decrease
NON-OPERATING INCOME			
Income from lease of road	$164,397.38	$143,185.40 +	$21,211.98
Miscellaneous rent income	5,887,457.91	5,610,332.00 +	277,125.91
Miscellaneous non-operating physical property	3,448,361.23	2,889,944.27 +	558,416.96
Separately operated properties—profit	2,003,285.39	720,399.80 +	1,282,885.59
Dividend income	14,916,581.73	13,041,084.56 +	1,875,497.17
Income from funded securities and accounts	6,045,985.10	6,136,742.40 —	90,757.30
Income from unfunded securities and accounts	4,377,680.68	5,072,782.07 —	695,101.39
Income from sinking and other reserve funds	211,044.92	203,232.39 +	7,812.53
Release of premiums on funded debt		65.00 —	65.00
Miscellaneous income	2,672,189.25	314,246.38 +	2,357,942.87
TOTAL NON-OPERATING INCOME	$39,726,983.59	$34,132,014.27 +	$5,594,969.32
GROSS INCOME	$96,998,633.02	$137,877,460.77 —	$40,878,827.75
DEDUCTIONS FROM GROSS INCOME			
Rent for leased roads	$27,762,047.27	$28,635,066.07 —	$873,018.80
Miscellaneous rents	1,523,115.86	1,335,210.90 +	187,904.96
Miscellaneous tax accruals	2,097,182.75	1,979,261.65 +	117,921.10
Separately operated properties—loss	148,657.42	123,462.01 +	25,195.41
Interest on funded debt	27,217,659.95	26,497,379.92 +	720,280.03
Interest on unfunded debt	1,414,406.50	765,906.17 +	648,500.33
Amortization of discount on funded debt	539,844.68	829,331.31 —	289,486.63
Maintenance of investment organization	35,277.11	10,478.93 +	24,798.18
Miscellaneous income charges	278,649.61	272,780.04 +	5,869.57
TOTAL DEDUCTIONS FROM GROSS INCOME	$61,016,841.15	$60,448,877.00 +	$567,964.15
NET INCOME	$35,981,791.87	$77,428,583.77 —	$41,446,791.90
Per cent to capital stock outstanding	(7.21)	(16.70) —	(9.49)
DISPOSITION OF NET INCOME			
Sinking and other reserve funds	$91,087.02	$190,948.89 —	$99,861.87
TOTAL APPROPRIATIONS OF INCOME	$91,087.02	$190,948.89 —	$99,861.87
SURPLUS FOR THE YEAR	$35,890,704.85*	$77,237,634.88 —	$41,346,930.03
Dividends declared during the year	$39,940,593.60	$37,090,531.60	

* See profit and loss statement.

Profit and Loss Account

BALANCE TO CREDIT OF PROFIT AND LOSS, DECEMBER 31, 1929		$295,010,378.40
ADDITIONS:		
The surplus income of The New York Central Railroad Company for the year 1930 based on the inclusion of results for the month of January as to the roads covered by the leases effective February 1, 1930, and as shown on the preceding page is	$35,890,704.85	
From this should be deducted the net income for the month of January, 1930, of the following companies whose lines were leased effective February 1, 1930:		
Michigan Central Railroad Company	$669,580.54	
Chicago Kalamazoo and Saginaw Railway Company	21,326.56	
Cleveland Cincinnati Chicago and St. Louis Railway Company	211,669.66	
Cincinnati Northern Railroad Company	82,007.47	
Evansville Indianapolis and Terre Haute Railway Company	20,902.56	1,005,486.79
leaving actual surplus for the year 1930, to be transferred to profit and loss		34,885,218.06
Profit on securities sold (net)	$103,310.98	
Profit on road and equipment sold	125,122.80	
Profit on sale of other property (net)	167,165.30	
Sundry adjustments (net), unrefundable overcharges and uncollectible accounts	19,919.75	415,518.83
		$330,311,115.29
DEDUCTIONS:		
Dividend appropriations of surplus	$39,940,593.60	
Depreciation prior to July 1, 1907, on equipment retired during the year	181,764.57	
Loss on property retired	906,637.52	
Loss upon securities owned (notes of New York State Railways and Schenectady Railway Co.)	1,889,148.00	
Other items (net)	609,045.72	43,527,189.41
BALANCE TO CREDIT OF PROFIT AND LOSS, DECEMBER 31, 1930		$286,783,925.88

Operating Expenses

Operating expenses were as follows:

Group	Amount	Increase	Decrease
Maintenance of way and structures	$64,832,895.51		$9,543,456.28
Maintenance of equipment	103,757,393.31		25,895,778.19
Traffic expenses	9,594,315.49	$90,597.93	
Transportation expenses	174,455,031.15		28,241,363.41
Miscellaneous operations	8,148,135.23		1,117,383.11
General expenses	16,664,346.08	289,670.36	
Transportation for investment —credit	722,698.80		98,462.66
Total	$376,729,417.97		$64,516,175.36

With due consideration for the requirements of safe operation, there were substantial reductions in most of the accounts comprising the maintenance of way and structures group, the most important decreases having been in expenditures for roadway maintenance, track laying and surfacing, rail, tie and ballast renewals, repairs to station and office buildings and shops and enginehouses and the removal of snow and ice.

The decrease in the cost of maintaining equipment was due to a reduced program of repairs and renewals of all classes of equipment, to less intensive use and to a reduction in the number of units retired, offset in part by increased accruals for depreciation due to additional equipment acquired.

The increase in traffic expenses occurs mainly in the cost of off-line solicitation and of publishing tariffs and supplements.

The decrease in transportation expenses is attributable to the decrease in traffic handled.

Railway Tax Accruals

Railway tax accruals were $34,009,020.80, a decrease of $5,760,392.75. Federal and Canadian income taxes decreased $7,500,352.38 and State taxes on gross earnings decreased $115,380.76, due to diminished revenues, while taxes on real and personal property increased $2,033,514.24.

Equipment Rents

The net debit to equipment rents amounted to $10,288,151.34, an increase of $3,538,899.93. Rental received for use of the company's freight cars decreased $8,223,809.78, as compared with a decrease of $4,939,394.42 in rental paid to others for that character of equipment, a difference of $3,284,415.35. Net debit to rent for passenger train cars increased $371,101.05, principally due to the increased mileage rates paid during 1930 for the use of equipment of the Pullman Company. Net rent for floating equipment decreased $56,459.58 and net rent from work equipment increased $82,807.78.

Joint Facility Rents

There was a net debit to joint facility rents of $530,479.77, as compared with a net credit of $1,594,102.32 in 1929, this difference of $2,124,582.09 being largely due to the payment in 1930 of $1,643,066.23 for the use of the facilities of the Cleveland Union Terminals Company put into service in June 1930, and to adjustments in the accounts relating to prior years.

Non-operating Income

Non-operating income amounted to $39,726,983.59, an increase of $5,594,969.32.

Net Income and Surplus for Year

The net income of the company on the basis of the income account was $35,981,791.87, amounting to 7.21 per cent upon the capital stock outstanding at the end of the year. After appropriation to sinking and other reserve funds amounting to $91,087.02, and after deducting $1,005,486.79, net income earned during January, 1930, by lines leased effective February 1, 1930, there remained a surplus of $34,885,218.06, which was carried to the credit of profit and loss. After dividend charges amounting to $39,940,593.60 and sundry adjustments, the profit and loss balance at the end of the year amounted to $286,783,925.88 and total corporate surplus to $290,275,410.91.

Dividends

The following dividends were declared and charged to surplus:

No. 62, 2 per cent on $499,257,295, declared March 12, 1930, payable May 1, 1930	$9,985,145.90
No. 63, 2 per cent on $499,257,395, declared June 11, 1930, payable August 1, 1930	9,985,147.90
No. 64, 2 per cent on $499,257,495, declared September 10, 1930, payable November 1, 1930	9,985,149.90
No. 65, 2 per cent on $499,257,495, declared December 10, 1930, payable February 2, 1931	9,985,149.90
Total for the year, 8 per cent	$39,940,593.60

The Board wishes to express its appreciation of the loyal and efficient service of the officers and employees of the company during the year.

For the Board of Directors,
P. E. CROWLEY,
President.

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More Mileage Between Renewals

THE wear-resisting properties of HUNT-SPILLER *AIR FURNACE* GUN IRON are helping many railroads to obtain greater mileage from those locomotive parts subjected to constant frictional wear and high superheat temperatures.

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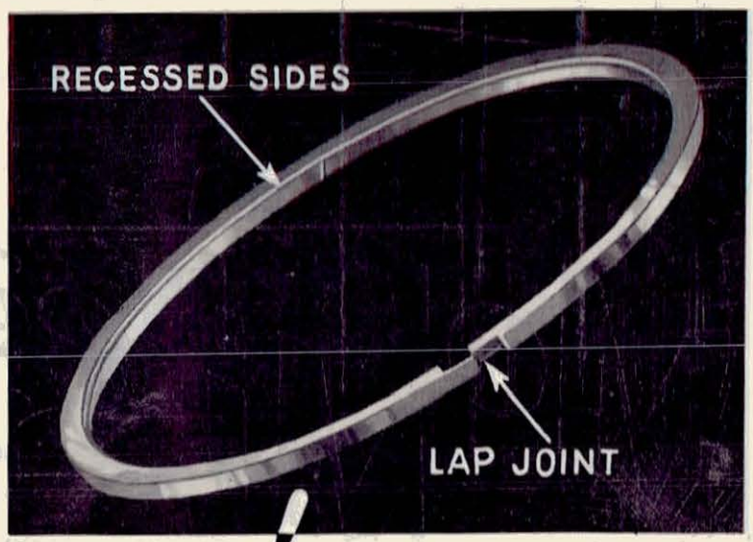
Air Furnace



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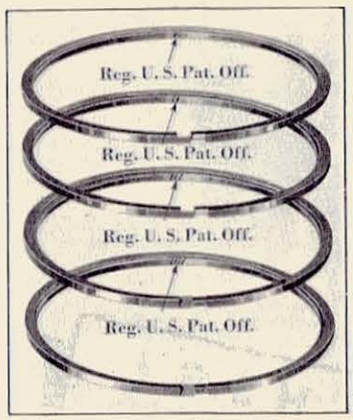
No other detail of air brake apparatus is more important—no other one has been the object of more thorough research—than the triple valve Piston Packing Ring . . . Intensive efforts to develop a superior design and means of manufacture culminated in the ***lap-joint-recessed ring,*** which embodies two outstanding improvements obtainable only in Westinghouse rings.

The distinctive lap-joint makes a continuous metal-to-metal contact in the piston groove and in the bushing, thereby preventing leakage past the ring ends at all times and under all practicable degrees of wear.

The ***exclusive*** recessed feature provides a shallow side bearing surface of equal depth all around the ring and the same on both sides. This permits a ring to be more easily lapped to an accurate fit—reduces possibility of distortion when it is slipped over the piston—and permits a neater fitted ring to move freely in the groove, and thus expand uniformly against the piston bushing.

The lap-joint is made by distinctive means and methods—the ***recessed feature*** is patented.



The four repair rings available for triple valves are marked with one, two, three, or four diagonal scratches, which serve to distinguish one size from the other, and to identify them all as Westinghouse rings — for these are *registered trade marks!*

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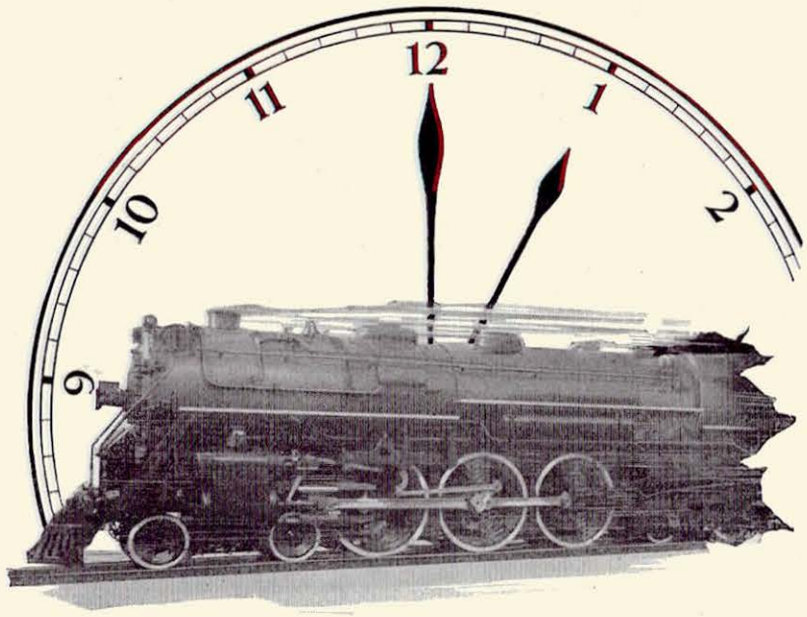

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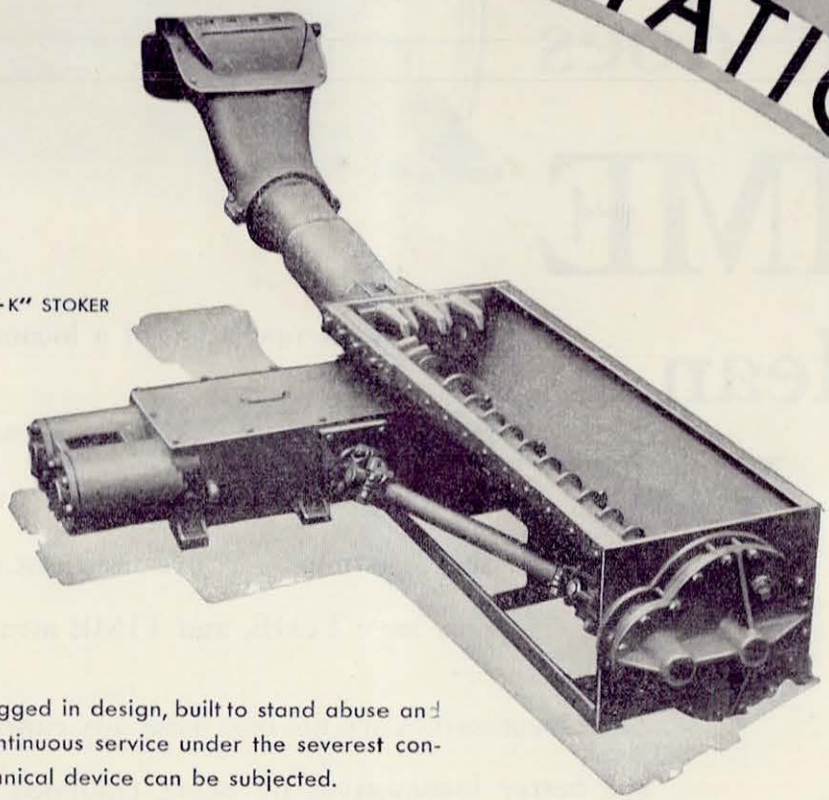

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STANDARD STOKERS are rugged in design, built to stand abuse and yet give unfailing, continuous service under the severest conditions to which any mechanical device can be subjected.

• Yet no matter how substantial a machine may be designed, two things are vital—alignment and fit of moving parts plus materials that will withstand the service.

• In the development and perfection of the various parts of Standard Stokers, many thousands of dollars have been invested in testing, in the selection of materials and in the development of operations that insure dependability of performance and complete interchangeability of the finished parts.

• It is on the reliable performance of Standard Stokers, the avoidance of detentions due to stoker troubles, the economy of service and the increased locomotive earning capacity due to stoker firing that the reputation of The Standard Stoker Company, Inc., is built.

• You can specify Standard Stokers and Standard Stoker Company Replacement Parts with every confidence of satisfactory, economical service.

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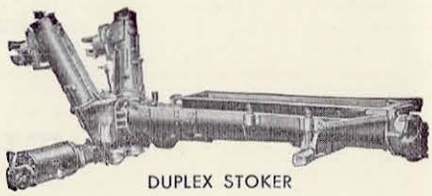

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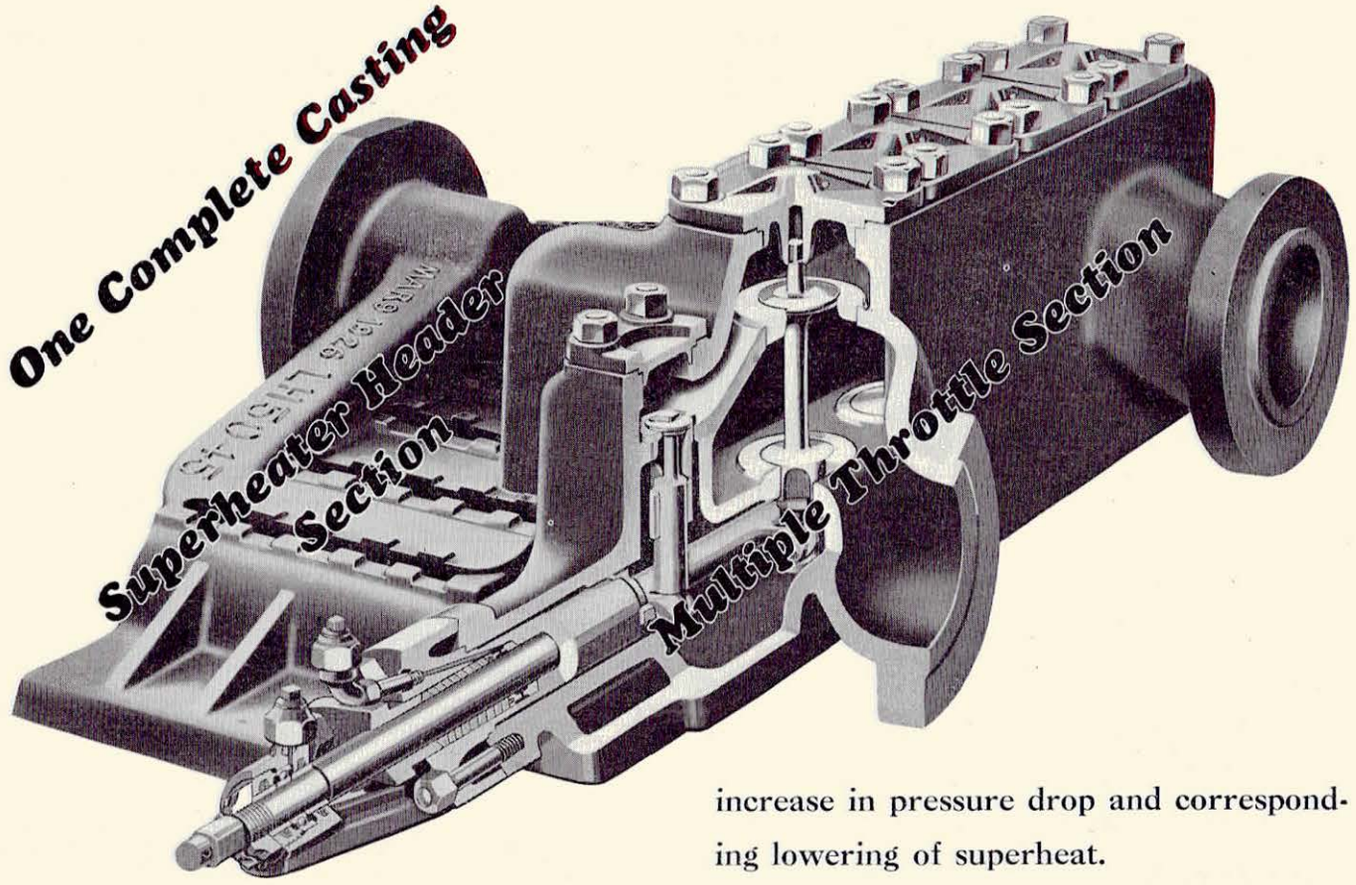

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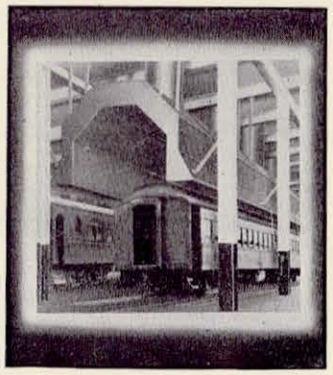

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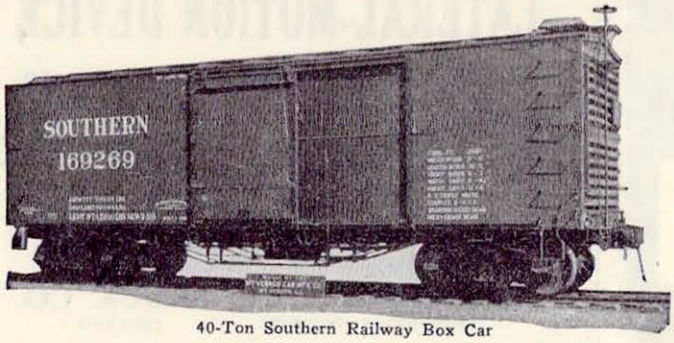

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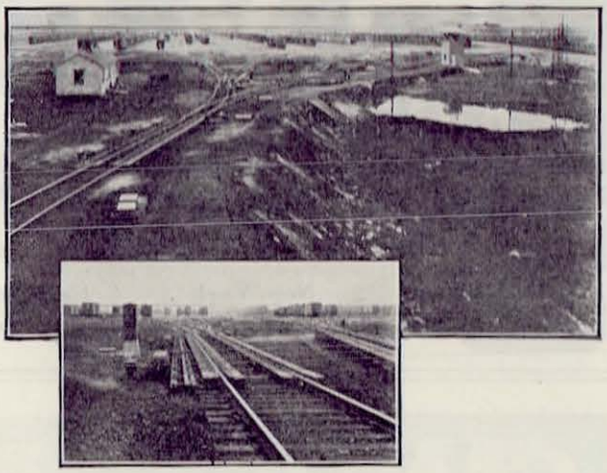

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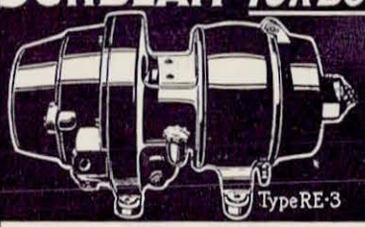

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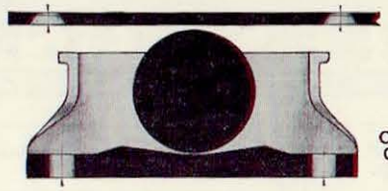
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For location of advertisements in this issue of manufacturers listed in the Buyers Index, see Advertisers Index on the last page next to cover

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Airport Drainage.
Republic Steel Corp.

Air Pumps.
New York Air Brake Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Air Reservoir Joints—(See Joints, Air Reservoir).

Alloy Steel.
Bethlehem Steel Co.
Illinois Steel Co.
Republic Steel Corp.
Ryerson & Son, Inc., Jos. T.

Alloys, Strong Aluminum.
Aluminum Co. of America.

Angle Bars — (See Joints, Rail).

Angles, Channels and Tees—(See Shapes, Structural).

Anti-Creepers, Rail.
Bethlehem Steel Co.
P. & M. Company, The.

Arch, Locomotive Brick.
American Arch Co., Inc.

Arresters, Lightning.
General Electric Co.
General Railway Signal Co.
P. & M. Company.
Railroad Supply Co., The.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Ash Conveyors.
Industrial Brownhoist Corp.

Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Ash Pans, Cast Steel.
General Steel Castings Corp.

Auxiliary Locomotive.
Bethlehem Steel Co.

Axles, Car and Locomotive.
American Locomotive Co.
Baldwin Locomotive Works.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Lima Locomotive Works.
Midvale Co., The.
Standard Steel Works Co.

Axles, Mine Car.
Brill Co., The J. G.
Mt. Vernon Car Mfg. Co.

Axles, Motor Trucks.
Timken-Detroit Axle Co.

Babbitt Metal.
National Bearing Metals Corp.
Ryerson & Son, Inc., Jos. T.
Westinghouse Elec. & Mfg. Co.

Baggage Door Controller Device.
Edwards Co., O. M.

Barges, Steel.
American Bridge Co.

Barges, Treated.
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Bars, Concrete, Reinforcing.
Carnegie Steel Co.
Central Alloy Steel Corp.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Bars, Iron and Steel.
Armco Railroad Sales Co.
Carnegie Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Illinois Steel Co.
Inland Steel Company.
Lockhart Iron & Steel Co.
McConway & Torley Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Bars, Rolled Steel.
Carnegie Steel Co.

Batteries, Lighting.
Electric Storage Battery Co.

Batteries, Starting.
Electric Storage Battery Co.

Batteries, Storage.
Electric Storage Battery Co.
Railroad Supply Co.
Safety Car Heating & Lighting Co.

Batteries, Wet Cell.
Electric Storage Battery Co.

Beams, Channel & Angle.
Carnegie Steel Co.
Illinois Steel Co.
Ryerson & Son, Inc., Joseph T.

Bearings, Axle Generator.
S. K. F. Industries, Inc.
Westinghouse Elec. & Mfg. Co.

Bearings, Ball Thrust.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

Bearings, Center.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Miner, W. H.
Pressed Steel Car Co.
Symington Co., The.

Bearings, Journal.
Fafnir Bearing Co.
Magnus Co., Inc.
National Bearing Metals Corp.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

Bearings, Journal Roller.
Fafnir Bearing Co.
S. K. F. Industries, Inc.
Timken Roller Bearing Co., The.

Bearings, Roller.
American Steel Foundries Co.
Fafnir Bearing Co.
Hyatt Roller Bearing Co.
Miner, W. H.
Shafer Bearing Corp.
S. K. F. Industries, Inc.
Standard Car Truck Co.
Stucki Co., A.
Timken Roller Bearing Co.
Wine Railway Appliance Co.

Bearings, Roller Side.
Q. & C. Company, The.
Standard Coupler Co.
Stucki Co., A.

Bearings, Side.
American Steel Foundries.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
Standard Car Truck Co.
Stucki Co., A.
Wine Railway Appliance Co.

Beds, Cast Steel, Locomotive.
General Steel Castings Corp.

Bell Ringer, Locomotive.
Ardco Mfg. Co.
Prime Mfg. Co., The.

Bells, Highway Crossing.
Railroad Supply Co.

Belt Lacing Machines.
Birdsboro Steel Foundry & Mach. Co.

Benders, Rail.
Q & C Co., The

Bending and Straightening Machines.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Billets, Steel.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
McConway & Torley Co.
Midvale Co., The.
Ryerson & Son, Jos. T.
Republic Steel Corp.
Standard Steel Works Co.

Blocks, Chain.
Barco Mfg. Co.

Blocks, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Blooms, Steel.
Carnegie Steel Co.
Republic Steel Corp.

Blower Fittings, Automatic Smokebox.
Barco Mfg. Co.

Blowers, Turbo.
Ingersoll-Rand Co.

Blowtorches, Acetylene.
Oxweld Railroad Service Co., The.

Boiler (all types).
Baldwin Locomotive Works, The.

Boiler Checks.
Prime Manufacturing Co., The.

Boilers, Locomotive.
American Locomotive Co.
Baldwin Locomotive Works
Lima Locomotive Works.

Boilers, Scale Proof.
Industrial Brownhoist Corp.

Bolsters, Steel.
American Steel Foundries.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Gould Coupler Co., The.
Mt. Vernon Car Mfg. Co.
Ohio Steel Foundry Co., The
Pressed Steel Car Co.
Symington & Son, Inc., T. H.

Bolts and Nuts.
Baldwin Locomotive Works, The
Bethlehem Steel Co.
Buffalo Brake Beam Co.
Dardelet Threadlock Corp.
Neely Nut & Bolt Co.
Russell, Burdsall & Ward Bolt and Nut Co.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Bolts & Nuts, Monel Metal.
International Nickel Co., The.

Bolts, Patch.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Bolts, Track.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Bonders, Rail.
Q & C Co., The.

Bonding Rail Outfits.
Ingersoll-Rand Co.

Bonds, Rail.
American Steel & Wire Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Bonds, Signal.
American Steel & Wire Co.
Railroad Supply Co.

Bond, Wire Protection.
P & M Co., The.

Boosters, Locomotive.
Franklin Railway Supply Co., Inc.

Boring & Drilling Machines, Horizontal.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Boring Machines, Car Wheel
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Horizontal.
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Vertical.
Sellers & Co., Inc., Wm.

Braces, Rail
Bettendorf Co., The.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
Q & C Co., The.
Ramapo Ajax Co.
Symington Co., The.

Brake Beam Safety Guards.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.

Brake Beam Supports.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.

Brake Beams.
American Steel Foundries.
Bradford Corporation.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Hunt-Spiller Mfg. Corp.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car. Co.

Brake Drums.
American Car & Foundry Motors Co.
Hunt-Spiller Mfg. Corp.

Brake Forgings, Pins, Levers, etc.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Davis Brake Beam Co.
Mt. Vernon Car Mfg. Co.
Schaefer Equipment Co.

Brakes, Hand.
National Brake Co.

Brake Heads.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Pressed Steel Car Co.

Brake Jaws.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Schaefer Equipment Co.

Brake Shoes.
American Brake Shoe & Foundry Co.
American Steel Foundries.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Fort Pitt Malleable Iron Co.
Mt. Vernon Car Mfg. Co.
Wheel Truing Brake Shoe Co.

Brake Shoes, Wheel Truing
Wheel Truing Brake Shoe Co.

Brakes, Air.
General Electric Co.
New York Air Brake Co.
Westinghouse Air Brake Co.

Brakes, Clasp.
American Steel Foundries.

Brakes, Electric.
New York Air Brake Co.
Westinghouse Air Brake Co.

Brakes, Hand.
Miner, W. H.
National Brake Co.
National Malleable & Steel Castings Co.
Wine Railway Appliance Co.

Brass, Sash.
Edwards Co., O. M.

Brick, Locomotive Arch.
American Arch Co., Inc.

Bridge Builders.
American Bridge Co.
Bethlehem Steel Co.

Bridge & Brossing Planks, Treated.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Flooring.
Carey Co., The, Philip.

Bridge Material, Treated.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Stringers — (See Stringers, Bridge).

Bronze Powder, Aluminum.
Aluminum Co. of America.

Bucket Handling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Buckets, Grab.
American Bridge Co.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Buffers, Friction.
Edgewater Steel Co.
Miner, W. H.
Standard Coupler Co.
Westinghouse Air Brake Co.

Buffers, Radial.
Franklin Railway Supply Co., Inc.

Building Materials.
Carey & Co., Philip, The.
Johns-Manville Corp.

Buildings, Iron, Steel and Steel Concrete.
American Bridge Co.
United Engineers & Constructors, Inc.

Bulldozers.
Ryerson & Son, Joseph T.

Buses, Motor.
Reo Motor Car Co.

Bushings, Driving & Engine Truck Boxes
Locomotive Finished Material Co.

Cable Accessories, Electrical.
Graybar Electric Co.

Cables, Electric.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Co.
Graybar Electric Co.
Kerite Insulated Wire & Cable Co.
Okonite Co., The.

Cableways—(See Tramways).

Caps, Grease.
Prime Mfg. Co., The.

Carbide, Calcium.
Oxweld Railroad Co., The.
Union Carbide Sales Co.

Car Insulation.
Carey & Co., Philip, The.

Car Lighting Equipment—(See Lighting, Car Equipment).

Carlines.
Hutchins Car Rfg. Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Car Material, Wood.
Central Coal & Coke Co.

Car Parts and Appliances.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Car Parts, Freight.
Bettendorf Co., The.
General American Tank Car Corporation.
Pressed Steel Car Co.

Car Parts, Passenger.
Brill Co., The J. G.
St. Louis Car Co.

Car Repairs.
General American Tank Car Corporation.
Pressed Steel Car Co.
St. Louis Car Co.
Tennessee Coal, Iron & Railroad Co.

Car Retarder Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Car Siding — (See Siding, Car, etc.).

Cars, Baggage.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Cars, Ballast.
Bethlehem Steel Co.
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Caboose, Coal & Stock.
Mt. Vernon Car Mfg. Co.

Cars, Convertible.
Mt. Vernon Car Mfg. Co.

Cars, Dump.
Bethlehem Steel Co.
Bettendorf Co., The.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Flat, Narrow Gauge.
Bettendorf Co., The.
Western Wheeled Scraper Co.

Cars, Freight.
Bethlehem Steel Co.
Bettendorf Co., The.
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Co.

Cars, Freight (New and Repaired).
Bethlehem Steel Co.
Bettendorf Co., The.
General American Tank Car Corp.
Pressed Steel Car Co.

Cars, Gasoline-Electric.
Brill Co., The J. G.
Electro-Motive Co.
St. Louis Car Co.

Cars, Gasoline Motor.
Brill Co., The J. G.

Cars, Hand & Push.
Fairbanks-Morse & Co.

Cars, Industrial.
Bethlehem Steel Co.
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Motor.
Fairbanks-Morse & Co.

Cars, Motor Inspection.
Fairbanks-Morse & Co.

Cars, Oil Electric.
Westinghouse Elec. & Mfg. Co.

Cars, Ore.
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.

Cars, Passenger.
Bethlehem Steel Co.
Brill Co., The J. G.
Electro-Motive Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Cars, Power Units.
Brill Co., The J. G.
Electro-Motive Co.

Cars, Quarry.
Western Wheeled Scraper Co.

Cars, Rebuilt and Repaired.
Bettendorf Co., The.
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Refrigerator.
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Cars, Second-Hand.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Self-Propelled Passenger.
Brill Co., The J. G.
Electro-Motive Co.
General Electric Co.
Pullman Car & Mfg. Corp.
Westinghouse Elec. & Mfg. Co.

Cars, Spreader.
Western Wheeled Scraper Co.

Cars, Tank.
Bethlehem Steel Co.
General American Tank Car Corp.
Indian Refining Co.
Pressed Steel Car Co.

Cars, Dump.
Western Wheeled Scraper Co.

Castings, Alloy Steel.
Symington Co., The.
Union Spring & Mfg. Co.

Castings, Brass and Bronze.
Baldwin Locomotive Works, The.
General Railway Signal Co.
Magnus Co., Inc.
National Bearing Metals Corp.
Union Switch & Signal Co.

Castings, Gray Iron.
American Brake Shoe & Foundry Co.
American Locomotive Co.
Baldwin Locomotive Works.
General Railway Signal Co.
Locomotive Finished Material Co.
Mt. Vernon Car Mfg. Co.
Ramapo Ajax Corp.
Union Switch & Signal Co.

Castings, Gun Iron.
Hunt-Spiller Mfg. Corp.

Castings, Iron & Steel.
Baldwin Locomotive Works, The.
Industrial Brownhoist Corp.

Castings, Malleable Iron.
Buckeye Steel Castings Co.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
P & M Company, The.
Pressed Steel Car Co.
Symington Co., The.
Universal Draft Gear Attachment Co.

Castings, Monel Metal.
International Nickel Co., The.

Castings, Steel.
Allegheny Steel Co.
American Locomotive Co.
American Steel Foundries.
Bethlehem Steel Co.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Buckeye Steel Castings Co.
General Steel Castings Corp.
Gould Coupler Co., The.
McConway & Torley Co.
Midvale Co., The.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Steel Casting Co.
Universal Draft Gear Attachment Co.

Castings, Steel Loco.
Birdsboro Steel Foundry & Machine Co.
General Steel Castings Corp.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Castings, Steel Vanadium.
Birdsboro Steel Foundry & Machine Co.
Brill Co., The J. G.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Catchbasins, Iron.
Armco Culvert Mfrs. Assoc.

Cellers, Engine Truck.
Ardco Mfg. Co.

Cement Car, Asphalt.
Lehon Co., The.
Sherwin-Williams Co.

Cement, High Temperature.
Carey Co., Philip, The.
Johns-Manville Corp.

Cements, Asbestos and Magnesia.
Carey Co., Philip, The.

Center Plates—(See Bearings, Center).

Center Sills.
Bettendorf Co., The.
Bradford Corporation.

Chain, Monel Metal.
International Nickel Co., The.

Chemicals.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.

Chemicals, Boiler.
Bird-Archer Co., The.
Dearborn Chemical Co.

Chemicals, Cleaning.
Oakite Products, Inc.

Chemists.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Chromium Plating.
Worthington Pump & Machinery Corp.

Chucks, Lathe.
Ryerson & Son, Jos. T.

Cinder Handling Plants.
Roberts & Schaefer Co.

Circuit Breakers.
General Electric Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Clamps, Forging.
Ryerson & Son, Jos. T.

Clamps, Guard Rail.
Q. & C. Co., The.
Westinghouse Air Brake Co.

Clamps, Hose.
Ingersoll-Rand Co.
National Malleable & Steel Castings Co.
Vapor Car Heating & Lighting Co.
Westinghouse Air Brake Co.

Clamps, Pipe.
Franklin Railway Supply Co., Inc.
National Malleable & Steel Castings Co.

Clamps, Rail Cutting.
Oxweld Railroad Service Co., The.

Classification Yard Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Cleaners, Aircraft.
Oakite Products, Inc.

Cleaners, Air Pump.
Oakite Products, Inc.
Westinghouse Air Brake Co.

Cleaners, Bus & Truck.
Oakite Products, Inc.

Cleaners, Car.
Oakite Products, Inc.

Cleaners, Flue.
Ryerson & Son, Jos. T.

Cleaners, General.
Oakite Products, Inc.

Cleaners, Locomotive.
Oakite Products, Inc.

Cleaners, Metal.
Oakite Products, Inc.

Clips, Wire Rope.
American Steel & Wire Co.

Coach and Coach Yard Steam Joints—(See Joints, etc.)

Coaches, Motor.
American Car & Foundry Motors Co.
Dodge Motor Truck Corp.
International Harvester Co.
White Co., The.

Coaches, SecondHand.
Hyman-Michaels Co.

Coal, Ore & Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.
Roberts & Schaefer Co.

Coal Pushers.
Standard Stoker Co.

Coaling Stations.
American Bridge Co.
FairbanksMorse & Co.
Roberts & Schaefer Co.

Cocks, Angle.
Westinghouse Air Brake Co.

Cocks, Blow-Off.
Bird-Archer Co., The.

Cocks, Cylinder.
Prime Manufacturing Co., The.

Columns, Water.
Prime Manufacturing Co., The.

Combination Crane Pile Drivers.
Industrial Brownhoist Corp.

Compounds, Boiler.
Dearborn Chemical Co.
Bird-Archer Co., The.

Compounds, Cleaning.
Oakite Products, Inc.

Compounds, Cutting.
Oakite Products, Inc.

Compounds, Grinding.
Oakite Products, Inc.

Compounds, Paint Removing.
Oakite Products, Inc.

Compounds, Rust Proofing.
Oakite Products, Inc.

Compressors, Air.
Ingersoll-Rand Co.
New York Air Brake Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Concrete Floor Slabs.
Federal American Cement Tile Co.

Concrete Reinforcement.
American Steel & Wire Co.
Carnegie Steel Co.
Ryerson & Son, Jos. T.

Concrete Roofing, Tile.
Federal American Cement Tile Co.

Condensers.
Ingersoll-Rand Co.

Condensing Apparatus.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Conduit, Rigid.
Aluminum Co. of America.

Conduits, Metallic Flexible.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Graybar Electric Co.
Vapor Car Heating Co., Inc.

Conduit, Underground.
Graybar Electric Co.
Johns-Manville Corp.

Connections, Lever.
National Malleable & Steel Castings Co.

Connections, Truck.
National Malleable & Steel Castings Co.

Connections, Truck Lever.
Schaefer Equipment Co.

Contraction Joint.
General Railway Signal Co.

Control Devices, Train Speed.
Union Switch & Signal Co.

Control, Locomotive.
Valve Pilot Co.

Controllers, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Conveying Machinery.
American Bridge Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Corrugated Sheet.
Aluminum Co. of America.

Conveyor, Ash—(See Coal, Ore and Ash Handling Mach.).

Coupler Pockets—(See Draft Yokes).

Coupler Yokes.
Bettendorf Co., The.
Gould Coupler Co.
Symington Co., The.

Couplers.
American Steel Foundries.
Buckeye Steel Castings Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
McConway & Torley Co.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Westinghouse Air Brake Co.

Couplings, Hose.
Fort Pitt Malleable Iron Co.
Gold Car Heating & Lighting Co.
Ingersoll-Rand Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Cranes, Ballast Cleaning.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Barge.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Bracket.
Shephard-Niles Crane & Hoist Corp.

Cranes, Crawler.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Crawling Shovels and Draglines.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Diesel.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Electric Traveling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Gantry.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.
Shephard-Niles Crane & Hoist Corp.

Cranes, Gasoline.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Grab Bucket.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Handpower.
Industrial Brownhoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Jib.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Worthington Pump & Machinery Corp.

Cranes, Locomotive.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

Cranes, Overhead.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Pillar.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Portable.
Orton Crane & Shovel Co.

Cranes, Transfer.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Traveling.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Wharf.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Wrecking.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Crank Pins — (See Pins, Crank).

Creosote.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
National Lumber & Creosoting Co.

Creosote, Wood Preservative Treatment.
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Cribbing Units.
Federal American Cement Tile Co.

Cross Arms, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cross Ties, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cross Ties, Steel.
Bethlehem Steel Co.

Crossheads & Shoes.
Baldwin Locomotive Wks.
Barco Mfg. Co.
International Creosoting & Construction Co.

Crossing Signals & Signs.
Railroad Supply Co.

Crossings—(See Frogs and Crossings).

Crossings, Pavement.
Carey Co., The Philip.

Crushers, Coal.
American Sheet & Tin Plate Co.
Orton Crane & Shovel Co.

Culverts.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.
Toncan Culvert Manufacturers' Association.

Culverts, Corrugated Iron
Armco Culvert Manufacturers' Association.
Republic Steel Corp.

Culverts, Part Circle
Armco Culvert Manufacturers Association

Culverts, Treated.
Century Wood Preserving Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Cups, Oil.
Hammett, H. G.
New York Air Brake Co.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

Curtains & Fixtures, Car Window.
Pantasote Co., Inc., The.

Curtain Material, Car.
Ryerson & Son, Jos. T.

Curtains, Cab.
Lehon Co., The.

Cutting and Welding Apparatus.
Oxweld Railroad Service Co.
Westinghouse Electric & Mfg. Co.

Cut-Off Indicators and Recorders.

Cylinder Parts, Finished and Rough.
Locomotive Finished Material Co.
National Tube Co.
Valve Pilot Co.

Cylinders, Air Brake.
Westinghouse Air Brake Co.

Cylinders, Cast Steel Locomotive.
General Steel Castings Corp.
Union Steel Casting Co.

Cylinders, Locomotive.
Locomotive Finished Material Co.

Cylinders, Oxy-Acetylene.
Oxweld Railroad Co., The.

Deoxidizers.
Q & C Co., The.
Vanadium Corp. of America.

Derricks.
Industrial Brownhoist Corp.

Diesel Electric Power Plants.
Fairbanks-Morse & Co.
Westinghouse Elec. & Mfg. Co.

Dirt Collectors.
New York Air Brake Co.
Westinghouse Air Brake Co.

Disinfectants.
West Disinfecting Co.

Dispatching Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Ditching Machinery.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Door Fixtures — (See Fixtures, Car Door).

Doors, Car.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
Wine Railway Appliance Co.

Doors, Locomotive Firebox.
Franklin Railway Supply Co., Inc.

Doors, Rolling, Steel.
Kinnear Mfg. Co.

Draft Arms.
American Steel Foundries.
Birdsboro Steel Foundry & Machine Co.
Bradford Corporation.
Symington Co., The.
Universal Draft Gear Attachment Co.

Draft Gear Attachments.
Symington Co., The.

Draft Gears.
American Steel Foundries.
Bradford Corporation.
Cardwell-Westinghouse Co.
Edgewater Steel Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Union Draft Gear Co.
Universal Draft Gear Attachment Co.

Draft Yokes.
American Steel Foundries
Bettendorf Co., The.
Buckeye Steel Castings Co
Gould Coupler Co., The.
McConway & Torley Co.
Miner, W. H.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Co.
Symington Co., The.
Universal Draft Gear Attachment Co.

Drainage Gates, Automatic
Armco Culvert Mtrs. Assoc.
Republic Steel Corp.

Drains, Perforated Iron.
Republic Steel Corp.

Drawbar Centering Device.
Gould Coupler Co., The.
Miner, W. H.

Drawbars, Unit Safety.
Franklin Railway Supply Co., Inc.
Industrial Brownhoist Corp.

Dredging Machinery.
Industrial Brownhoist Corp.

Drilling Machines.
Sellers & Co., Inc., Wm.

Drilling Machines, Bonding.
Railroad Supply Co.

Drilling Machines, Pneumatic
Ingersoll-Rand Co.

Drilling Machines, Rock.
General Electric Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drilling Machines, Upright and Radial.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Drills.
Ingersoll-Rand Co.

Drills, Close Corner.
Ingersoll-Rand Co.

Drills, Concrete.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drills, Steel Rock and Steel Sharpened.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drills, Track & Bending.
Bird-Archer Co., The.
Ingersoll-Rand Co.

Drive Gas Electric Coaches.
General Electric Co.

Drive Gas Electric Locomotives
Westinghouse Electric & Mfg. Co.

Driving Boxes (Extended Main).
Franklin Railway Supply Co., Inc.

Drop Door Mechanism.
Wine Railway Appliance Co.

Dynamos—(See Generators, Electric).

Electrical Cable Accessories.
General Electric Supply Corp.

Electric Cables.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

Electrical Instruments.
Electric Service Supplies Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Electrical Supplies.
General Electric Co.
General Electric Supply Corp.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Electrification, Railroad.
Battey & Kipp.
General Electric Co.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Electric Heaters.
General Electric Supply Corp.

Electrical Insulation.
General Cable Corp.
General Electric Supply Corp.

Electrical Porcelain Insulators.
General Electric Supply Corp.

Electric Motors.
General Electric Supply Corp.

Electric Rivet Heaters.
General Electric Supply Corp.

Electric Switches.
General Electric Supply Corp.

Enamels.
Lowe Bros. Co., The.
Sherwin-Williams Co.

End Frames, Cast Steel, Passenger Car.
General Steel Castings Corp.

Ends, Steel.
Hutchins Car Rfg. Co.
Union Metal Products Co.

Engineers, Consulting, Civil, Elec., Hydraulic. Mechanical.
Battey & Kipp.
Hunt Co., Robt. W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Contracting.
Battey & Kipp.
United Engineers & Constructors, Inc.

Engineers and Contractors.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Construction.
Battey & Kipp.
Roberts & Schaefer Co.
United Engineers & Constructors, Inc.

Engineers and Contractors, Elec., Hydraulic, Mech.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
Roberts & Schaefer Co.

Engineers, Inspecting.
Gulick-Henderson Co.
Hunt Co., Robert W.
Muhlfeld, John E.
Pittsburgh Testing Laboratory.
United Engineers & Constructors, Inc.

Engineers, Valuation.
Hunt Co., Robert W.
United Engineers & Constructors, Inc.

Engines, Crude & Fuel Oil.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Diesel.
Worthington Pump & Machinery Corp.

Engines, Gas.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Engines, Gas & Gasoline.
American Car & Foundry Motors Co.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Hoisting.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Excavators.
Industrial Brownhoist Corp.

Exhaust & Heater Pipe.
Union Asbestos & Rubber Co.

Exhaust & Ventilating Fans.
General Electric Supply Corp.

Expanders, Tube.
Ryerson & Son, Joseph T.

Fans, Exhaust & Ventilating.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Fasteners, Car Door.
Camel Sales Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Feed Water Heater Systems.
Bird-Archer Co., The.
Coffin, Jr., Co., The J. S.
Worthington Pump & Machinery Corp.

Fencing Wire—(See Wire, Fence).

Fence Posts, Treated.
American Steel & Wire Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Ferro Alloys.
Vanadium Corp. of America.

Ferro, Chromium.
Vanadium Corp. of America.

Ferro, Molybdenum.
Electro Metallurgical Sales Corp.
Vanadium Corp. of America.

Ferro, Silicon.
Vanadium Corp. of America.

Ferro, Tungsten.
Vanadium Corp. of America.

Ferro, Vanadium.
Vanadium Corp. of America.

Filters, Air.
New York Air Brake Co.
Westinghouse Air Brake Co.

Filters, Water & Industrial.
Graver Tank & Mfg. Corp.

Filtration Plants (Water).
Graver Tank & Mfg. Corp.

Fireboxes.
American Locomotive Co.
Baldwin Locomotive Works.

Fire Fighting & Protection Equipment.
Johns-Manville Corp.

Fittings, Air Brakes.
Westinghouse Air Brake Co.

Fittings, Steam.
Vapor Car Heating Co., Inc.

Fixtures, Car Door.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Flangers, Snow.
Q & C Co., The.

Floodlights.
General Electric Supply Corp.
Graybar Electric Co.
Oxweld Railroad Service Co.
Pyle-National Co.
Symington Co., The.
Westinghouse Elec. & Mfg. Co.

Floodlights, Acetylene.
Oxweld Railroad Service Co., The.

Flooring.
Carey & Co., Philip, The.
Johns-Manville Corp.

Flooring, Car.
Tuco Products Corp.

Flooring, Coach.
Tuco Products Corp.

Flooring, Composition.
Johns-Manville Corp.
Tuco Products Corp.

Flooring, Treated.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
National Lumber & Creosoting Co.

Floor Plates, Steel.
Carnegie Steel Co.
Illinois Steel Co.

Floor Slabs, Concrete.
American Cement Tile Mfg. Co.

Flue Cleaners—(See Cleaners, Flue).

Flue Cutters—(See Cutters, Flue).

Flues, Boiler—(See Tubes, Boiler).

Flue Shop Equipment.
Ryerson & Son, Joseph T.

Forges, Rivet Heating.
Ryerson & Son, Joseph T.

Forging Hammers.
Industrial Brownhoist Corp.

Forgings.
American Bridge Co.
American Steel Foundries.
Baldwin Locomotive Works, The.
Bethlehem Steel Co.

Brill Co., The J. G.
Carnegie Steel Co.
Edgewater Steel Co.
General Railway Signal Co.
Gould Coupler Co., The.
Illinois Steel Co.
Midvale Co., The.
Mt. Vernon Car Mfg. Co.
Neely Nut & Bolt Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Steel Car Forge Co.
Universal Draft Gear Attachment Co.

Forgings, Drop.
Baldwin Locomotive Works, The.
Brill Co., The J. G.
General Railway Signal Co.
Steel Car Forge Co.
Union Switch & Signal Co.

Forgings, Monel Metal.
International Nickel Co., The.

Foundry Supplies.
Bird-Archer Co., The.

Frames, Cast Steel Locomotive
General Steel Castings Corp.

Frames, Locomotive.
American Steel Foundries.
American Locomotive Co.
Baldwin Locomotive Works.
Birdsboro Steel Foundry & Machine Co.
Ohio Steel Foundry Co., The.
Union Steel Casting Co.

Frames, Truck.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works
Bettendorf Co., The.
Birdsboro Steel Foundry & Machine Co.
Buckeye Steel Castings Co.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Pyle-National Co.
Symington Co., The.

Frames, Vanadium.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Machine Co.
Union Steel Casting Co.

Frogs and Crossings.
Bethlehem Steel Co.
Ramapo Ajax Corp.

Fulcrums, Brake Beam.
American Steel Foundries.
Brill Co., The J. G.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
National Malleable & Steel Castings Co.

Furnaces, Electric.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Furnaces, Gasoline.
Railroad Supply Co.

Furnaces, Rivet Heating—(See Forges, Rivet Heating).

Furniture.
Aluminum Co. of America.

Gage Testers—(See Testers, Gage).

Gages, Air.
Westinghouse Air Brake Co.

Gages, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Gages, Steam.
Ashton Valve Co.

Gages, Tire.
Schrader's Son, Inc., A.

Gages, Wheel Press Recording.
Ashton Valve Co.

Gaskets.
Westinghouse Air Brake Co.

Gasoline.
Ethyl Gasoline Corp.

Gear Blanks, Rolled Steel.
Edgewater Steel Co.
Standard Steel Works Co.

Gears and Pinions.
American Steel Foundries.
Westinghouse Elec. & Mfg. Co.

Gears, Silent.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Gears, Valve — (See Valve Gears).

Generators, Acetylene.
Oxweld Railroad Service Co.

Generators, Car Lighting.
Safety Car Heating & Lighting Co.

Generators, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Goggles, Welding.
Oxweld Railroad Service Co., The.
Sunbeam Electric Mfg. Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Grapples, Wood.
Industrial Brownhoist Corp.

Grate Bars.
Q & C Co., The.

Grate Shakers, Automatic.
Franklin Railway Supply Co., Inc.

Grates.
Firebar Corp.

Grease Forming Machines.
Franklin Railway Supply Co., Inc.

Grey Iron.
American Brake Shoe & Foundry Co.

Grinders, Internal.
Micro Machine Co.

Grinders, Portable Crank Pin.
Micro Machine Co.

Grinding Machines.
Sellers & Co., Inc., Wm.

Grinding Machines, Portable.
Ingersoll-Rand Co.
Ryerson & Son, Inc., Joseph T.

Guard Rails, Treated.
Curtin-Howe Corp.
International Creosoting & Construction Co.

Guard Rails, Foot Guard.
Q & C Co., The.

Guard Rails (One Piece).
Be[illegible] Steel Co.
Ram[illegible] Corp.

Guard Switch Point.
Q & C Co., The.

Guards, Cattle.
American Bridge Co.

Guards, Dust.
Gould Coupler Co., The.
Symington Co., The.

Hair Felt.
Johns-Manville Corp.

Hammers, Pneumatic.
Ingersoll-Rand Co.

Hammers, Riveting.
Ingersoll-Rand Co.

Hammers, Steam.
Industrial Brownhoist Corp.
Sellers & Co., Inc., Wm.

Hand Brakes—(See Brakes, Hand).

Hangers, Ball Bearing.
S. K. F. Industries, Inc.

Hand Rails & Fittings.
Aluminum Co. of America.

Hangers, Bottom Rod Safety.
Chicago Railway Equipment Co.

Hangers, Car Door—(See Fixtures, Car Door).

Headgates, Sliding
Armco Culvert Manufacturers Association

Headlight Repair Parts, Electric.
Electric Service Supplies Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Headlights, Electric.
General Electric Co.
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

Headlights, Reflectors & Cases.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Heaters, Electric.
Gold Car Heating & Lighting Co.
Westinghouse Electric & Mfg. Co.

Heaters, Feedwater.
Graver Tank & Mfg. Corp.

Heaters, Feedwater Locomotive.
Coffin Co., Jr., The J. S.
Superheater Company, The.
Worthington Pump & Machinery Corp.

Heaters, Feed Water, Stationary.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Heating & Ventilating Apparatus.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.
Westinghouse Electric & Mfg. Co.

Heating Equipment, Car.
Gold Car Heating & Lighting Co.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Heating Systems, Car (Electric and Steam).
Gold Car Heating & Lighting Co.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

High Temperature Cements.
Carey & Co., Philip, The.

Highway Crossing Protection Devices.
American Bridge Co.
Franklin Railway Supply Co., Inc.
Griswold Signal Co.
Railroad Supply Co.

Hoists, Chain.
Milwaukee Electric Crane & Hoist Corp.
Ryerson & Son, Jos. T.

Hoists, Electric.
Milwaukee Electric Crane & Hoist Corp.

Hoists, Pneumatic.
Ingersoll-Rand Co.

Hoists, Second-Hand.
Hyman-Michaels Co.

Hoisting Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Hooks, Wrecking.
National Malleable & Steel Castings Co.

Horns, Pneuphonic.
Westinghouse Air Brake Co.

Hose, Air, Steam, Etc.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Hose, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Hose, Tender.
Westinghouse Air Brake Co.

Incandescent Lamps.
General Electric Supply Corp.

Indicators, Speed & Cut-off.
Valve Pilot Co.

Ingots.
Birdsboro Steel Foundry & Machine Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
McConway & Torley Co.
Standard Steel Works Co.

Injectors, Exhaust Steam.
Sellers & Co., Inc., Wm.
Superheater Co., The.

Inspection of Material and Equipment—(See Engineers, Inspection).

Insulated Wire.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

Insulation, Car.
Carey Co., Philip, The.

Insulation, Car, Bldg.
Carey Co., Philip, The.
JohnsManville Corp.
Lehon Co., The.
Tuco Products Corp.
Union Asbestos & Rubber Co.

Insulation, Electrical.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Insulation, Exhaust & Heater Pipe.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co.

Insulation, Heat.
Carey Co., Philip, The.
Miner, W. H.

Insulation Tape.
General Electric Supply Corp.

Insulators, Electrical, Porcelain.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Interlocking Plant Equipment.
General Railway Signal Co.
Union Switch & Signal Co.

Iron Chain.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Charcoal.
Bethlehem Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Engine Bolt.
Lockhart Iron & Steel Co.
Logan Iron & Steel Co.
Ryerson & Son, Joseph T.

Iron, Forging Billets.
Lockhart Iron & Steel Co.
Logan Iron & Steel Co.

Iron, Hollow Staybolt.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Hollow Staybolt Bars.
Bethlehem Steel Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Pig.
Bethlehem Steel Co.

Iron, Refined.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Iron, Staybolt — (See also Staybolts).
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Logan Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Jacking, Locomotive.
Carey Co., Philip, The

Jacking Method of Installing Pipe
Armco Culvert Manufacturers Association

Jacks, Smoke.
Carey Co., Philip, The.
Johns-Manville Corp.

Joints, Air Reservoir.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Blow Off Line (Roundhouse).
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Coach and Coach Yard.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Flexible.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Flexible Ball.
Barco Mfg. Co.

Joints, Rail.
American Steel Foundries.
Carnegie Steel Co.
Illinois Steel Co.
Q & C Co., The.
Rail Joint Co.
Union Switch & Signal Co.

Joints, Steam, Air & Liquid.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Swing.
Barco Mfg. Co.
Vapor Car Heating Co., Inc.

Journal Boxes and Lids.
Allegheny Steel Co.
American Steel Foundries.
Brill Co., The J. G.
Gould Coupler Co., The.
Hunt-Spiller Mfg. Corp.
National Malleable & Steel Castings Co.
Pullman Car & Mfg. Corp.
Railway Steel Spring Co.
Symington Co., The.
Union Spring & Mfg. Co.

Journal Oilers, Car & Locomotive.
Ardco Mfg. Co.

Keys, Brake Shoe.
Bradford Corporation.
Buffalo Brake Beam Co.
Mt. Vernon Car Mfg. Co.
Steel Car Forge Co.
Union Spring & Mfg. Co.

Knuckles, Emergency.
Q & C Co., The.

Laboratories, Testing.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Lacquers.
General Electric Supply Corp.
Sherwin-Williams Co.

Ladders, Steel Car.
Wine Railway Appliance Co.

Lagging, Locomotive.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lamps, Incandescent.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lamps, Inspector's.
Oxweld Railroad Service Co., The.

Lath, Metal.
Armco Railroad Sales Co.

Lathes, Axle.
Sellers & Co., Inc., Wm.

Lathes, Engine.
Ryerson & Son, Joseph T.

Lathes, Wheel.
Sellers & Co., Inc., Wm.

Lead, White.
National Lead Co.

Lighting Equipment, Car.
Electric Storage Battery Co.
Safety Car Htg. & Ltg. Co.

Lighting Fixtures and Systems.
General Electric Supply Corp.
Graybar Electric Co.
Pyle-National Co.
Safety Car Htg. & Ltg. Co.

Lighting Plants, Gas, Electric
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.

Lightning Arresters.
General Electric Supply Corp.

Line Material.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lock Nuts—(See Nut Locks)

Locomotive Jacket Sheets.
Armco Railroad Sales Co.

Locomotive Water Conditioners
Bird-Archer Co., The.

Locomotives, Contractors.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Electric.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Locomotives, Gasoline.
Baldwin Locomotive Works.

Locomotives, Gas-Electric.
Brill Co., The J. G.
Electro-Motive Co.

Locomotives, Geared.
Lima Locomotive Works.

Locomotives, Industrial.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Mine.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Oil Engine, Electric Driven.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.
Whitcomb Locomotive Co., The.

Locomotives, Rebuilt.
American Locomotive Co.

Locomotives, Repair Parts.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Second-Hand.
Hyman-Michaels Co.

Locomotives, Steam.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotive Stokers.
Standard Stoker Co.

Locomotive Valve Pilot.
Valve Pilot Co.

Lubricators, Driving Box.
Franklin Railway Supply Co., Inc.

Lubricators, Piston Rod.
Q & C Co., The.

Lumber, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lumber, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
Industrial Lumber & Creosoting Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Machinery, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Machine Screws, Monel Metal
International Nickel Co., The.

Magnets, Lifting.
Industrial Brownhoist Corp.
Electro Metallurgical Sales Corp.

Mechanical Draft Apparatus—(See Heating and Vent. App.).

Mechanical Stokers.
Standard Stoker Co.

Melters, Snow, Electric.
Q & C Co., The.

Metallic Flexible Conduit.
General Electric Supply Corp.

Meters, Water & Oil.
Worthington Pump & Machinery Corp.

Milling Machines, Planer Type.
Sellers & Co., Inc., Wm.

Milling Machines, Plain and Universal.
Ryerson & Son, Joseph T.

Milling Machines, Portable Frame Jaw.
Micro Machine Co.

Mohair Upholstery Velvets.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Molybdenum Metal.
Vanadium Corp. of America.

Monel Metal, Rods, Sheets, Tubes, Wire, etc.
International Nickel Co., The.

Motors, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Motors & Generators.
Fairbanks-Morse & Co.

Moulding.
Aluminum Co. of America.

Multiple V Belt Drives.
Worthington Pump & Machinery Corp.

Nails.
American Steel & Wire Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Nipples, Air Hose.
Prime Manufacturing Co.

Nozzles, Exhaust.
Franklin Railway Supply Co., Inc.

Nozzles, Oxy-Acetylene Cutting.
Oxweld Railroad Service Co., The.

Nuts—(See Bolts and Nuts).

Nut Locks.
Dardelet Threadlock Corp.
Grip Nut Co.

Nuts, Tank Hose.
Prime Manufacturing Co., The.

Office Appliances.
Remington-Rand Business Service.

Oil-Electric Locomotives.
American Locomotive Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.

Oil Filtering & Storage Systems.
Graver Tank & Mfg. Corp.

Oil, Linseed.
National Lead Co.

Oil Plugs, Steam Chest.
Franklin Railway Supply Co., Inc.

Oxy-Acetylene Apparatus.
Oxweld Railroad Service Co., The.

Oxygen.
Oxweld Railroad Service Co., The.

Packing.
Westinghouse Air Brake Co.

Packing, Air Pump.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.

Packing, Asbestos.

Packing, Cylinder and Valve Ring.
Johns-Manville Corp.
Hunt-Spiller Mfg. Corp.
Locomotive Finished Material Co.
Westinghouse Air Brake Co.

Packing, Locomotive Cab Cock.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Ring Boiler.
Union Asbestos & Rubber Co.

Packing, Semi-Metallic.
Pilot Packing Co.
Central Alloy Steel Corp.

Packing, Sheet.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Soft.
Carey & Co., Philip, The.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.

Packing, Throttle.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing Valve Stem.

Paint Burners, Acetylene.
Oxweld Railroad Service Co., The.

Paint, Metal Protective.
Lowe Bros. Co., The.
National Lead Co.
Sherwin-Williams Co.

Paint, Powder.
Aluminum Co. of America.

Paint Spraying Equipment.
De Vilbiss Mfg. Co., The.

Paints.
Lowe Bros. Co., The.
National Lead Co.
Sherwin-Williams Co.

Paper, Carbon.
Remington-Rand Business Service.

Paper, Sheathing.
Carey & Co., Philip, The.

Patterns, for Iron, Steel & Brass Castings.
Baldwin Locomotive Works, The.

Pavement Breakers.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pickling Equipment, Monel Metal.
International Nickel Co., The.

Pile Drivers.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Piling, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Piling, Sheet Steel.
American Bridge Co.
Carnegie Steel Co.

Pilot Beams, Cast Steel.
General Steel Castings Corp.
Gould Coupler Co., The.

Pilots, Cast Steel.
General Steel Castings Corp.
Locomotive Finished Material Co.

Pins, Air Brake & Clevis.
Champion Rivet Co.

Pins, Center.
Miner, W. H.

Pins, Coupler Knuckle.
Champion Rivet Co.
McConway & Torley Co.
National Malleable & Steel Castings Co.

Pins, Crank.
American Locomotive Co.
Baldwin Locomotive Works.
Miner, Inc., W. H.
Standard Steel Works Co.
Union Asbestos & Rubber Corp.

Pipe, Corrugated Iron
Armco Culvert Manufacturers Association

Pipe, Paved Invert
Armco Culvert Manufacturers Association

Pipe Coverings.
Carey & Co., Philip, The.
Johns-Manville Corp.
Keasby & Mattison Co.

Pipe Fittings—(See Fittings, Pipe).

Pipe, Metal Culvert.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Republic Steel Corp.

Pipe, Perforated Iron
Armco Culvert Manufacturers Association

Pipe, Spiral Welded.
Armco Railroad Sales Co.

Pipe, Steel Signal.
National Tube Co.

Pipe, Spiral Welded.
Armco Railroad Sales Co.

Pipe, Wrought Iron.
Byers Co., A. M.
Reading Iron Co.

Planers, Plate.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Plates.
Steel Car Forge Co.

Plates, Follower.
Steel Car Forge Co.

Plates, Boiler, Firebox—(See Steel Firebox).

Plates, Center—(See Bearings, Center).

Plates, Iron & Steel.
Armco Railroad Sales Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Plate & Sheet Metal Work.
Baldwin Locomotive Works, The.

Plates, Tie.
Illinois Steel Co.
Inland Steel Company.
Railroad Supply Co.
Tennessee Coal, Iron & Railroad Co.

Plates, Tin and Terne.
American Sheet & Tin Plate Co.

Platforms, Car.
Gould Coupler Co., The.
Standard Coupler Co.

Platforms, Cast Steel, Passenger Car.
General Steel Castings Corp.

Plows, Railroad and Grading.
Western Wheeled Scraper Co.

Plows, Snow.
American Locomotive Co.
Brill Co., The J. G.
Q & C Co., The.

Plush, Mohair.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Pneumatic Tools.
Ingersoll-Rand Co.

Poles, Signal.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
General Railway Signal Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.
Union Switch & Signal Co.

Poles, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
General Electric Supply Corp.
Curtin-Howe Corp.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Poles, Steel Tubular.
Graybar Electric Co.
National Tube Co.

Posts, Fence, Treated.
Century Wood Preserving Co.
Curtin-Howe Corp.
Inland Steel Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Posts, Steel Fence.
American Steel & Wire Co.
Q & C Co., The.

Powder, Blasting—(See Explosives).

Powdered Coal Equipment.
Muhlfeld, John E.

Power Plants.
General Electric Co.
Muhlfeld, John E.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Power Transmission Supplies.
Sellers & Co., Inc., Wm.

Preservatives, Wood.
Century Wood Preserving Co.
Curtin-Howe Corp.
National Lumber & Creosoting Co.

Presses, Flanging Hydraulic.
Birdsboro Steel Foundry & Machine Co.

Presses, Hydraulic.
Baldwin-Southwark Corp.
Birdsboro Steel Foundry & Machine Co.

Presses, Wheel.
Birdsboro Steel Foundry & Machine Co.
Sellers & Co., Inc., Wm.

Pulverizers, Coal — (See Crushers, Coal).

Pumping Stations.
Fairbanks-Morse & Co.

Pump Liners, Monel Metal.
International Nickel Co., The.

Pump Rods, Monel Metal.
International Nickel Co., The.

Pump Shafts, Monel Metal.
International Nickel Co., The.

Pumps, Hydraulic.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pumps & Pumping Mchy.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Pumps, Vacuum.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Punching and Shearing Machines.
Ryerson & Son, Joseph T.

Pushers, Coal.
Standard Stoker Co.

Pyrometers, Superheated Steam.
Superheater Co., The.

Rail Anchors.
Bethlehem Steel Co.
P. & M. Co., The.

Rail-Bonds.
American Steel & Wire Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Rail Braces — (See Braces, Rail).

Rail Reclamation Equipment.
Ryerson & Son, Joseph T.

Railroad Shops.
United Engineers & Constructors, Inc.

Rail Splice Plates — (See Joints, Rail).

Railroad Structures — (See Engineers and Contractors; also Building).

Rails.
Bethlehem Steel Co.
Carnegie Steel Co.
Hyman-Michaels Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.
Tennessee Coal, Iron & Railroad Co.
Thomson Rail Corp.

Rails, Relaying.
Hyman-Michaels Co.

Railway Signals.
General Electric Supply Corp.

Rattan.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Receivers, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.

Recorders, Speed & Cut-off.
Valve Pilot Co.

Rectifiers for Signal Work.
General Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.

Reducing Valves.
Vapor Car Heating Co., Inc.

Reflectors, Headlight.
Pyle-National Co., The.
Sunbeam Electric Mfg. Co.

Refrigerators.
Wine Railway Appliance Co.

Regulators, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Relays.
General Railway Signal Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Removers, Paint & Varnish.
Oakite Products, Inc.

Repair Parts, Stoker.
Standard Stoker Co.
Q & C Company, The.

Retorts, Creosoting.
Graver Tank & Mfg. Corp.

Reverse Gear, Power.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Ringers, Bell
Hammett, H. S.

Rivet Cutters.
Ingersoll-Rand Co.

Riveters, Hydraulic.
Birdsboro Steel Foundry & Machine Co.

Riveting Machines.
Ingersoll-Rand Co.

Rivets.
Inland Steel Co.
Neely Nut & Bolt Co.
Ryerson & Son, Joseph T.
Pressed Steel Car Co.
Russell, Burdsall & Ward Bolt and Nut Co.

Rods.
Neely Nut & Bolt Co.

Rolled Steel.
Carnegie Steel Co.

Roller Bearings—(See Bearings, Roller).

Rolls, Bending & Straightening.
Birdsboro Steel Foundry & Machine Co.

Roof Slabs, Concrete.
Federal American Cement Tile Co.

Roofing, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.
Lehon Co., The.

Roofing, Buildings.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).

Roofing, Car.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey & Co., Philip, The.
Hutchins Car Rfg. Co.
Johns-Manville Corp.
Lehon Co., The.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).
Tuco Products Corp.
Union Metal Products Co.

Roofing, Corrugated.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey Co., Philip, The.
Johns-Manville Corp.

Roofing, Tile.
Federal American Cement Tile Co.

Roofing, Tile, Cement.
Federal American Cement Tile Co.

Roofing, Tin.
American Sheet & Tin Plate Co.

Rope, Wire — (See Wire Rope).

Rust Preventatives.
Dearborn Chemical Co.
Oakite Products, Inc.

Safe Ends.
National Tube Co.

Sand Drying Plants.
Roberts & Schaefer Co.

Sanitary Products.
West Disinfecting Co.

Sash Balances.
Tuco Products Co.

Saws, Circular Metal.
Ryerson & Son, Joseph T.

Saws, High Speed, Friction.
Ryerson & Son, Joseph T.

Saws, Portable Rail.
Industrial Brownhoist Corp.
Q & C Co., The.

Scales.
Fairbanks-Morse & Co.

Scrapers, Wheeled and Drag.
Western Wheeled Scraper Co.

Screens, Passenger Car.
Tuco Products Corp.

Seats, Car.
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Seats, Coach.
Brill Co., The J. G.

Shafting.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.
Standard Steel Works Co.

Shapers.
Ryerson & Son, Joseph T.

Shapes, Pressed Steel.
Pressed Steel Car Co.
Sellers & Co., Inc., Wm.

Shapes, Structural.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheds, Train.
American Bridge Co.
Inland Steel Co.

Sheets, Black and Galvanized.
Allegheny Steel Co.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Blue Annealed.
Allegheny Steel Co.

Sheets, Building, Special Car, Corrugated & Plain.
Armco Railroad Sales Co.

Sheets, Corrugated.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Carnegie Steel Co.
Johns-Manville Corp.
Ryerson & Son, Joseph T.

Sheets, Corrugated & Plain.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheets, Electrical.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Iron & Steel.
Armco Railroad Sales Co.
Bethlehem Steel Co.
Superior Sheet Steel Co., The (Division of Continental Steel Corp.).

Sheets, Locomotive Jacket.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.

Sheets, Polished or Planished Iron.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.

Sheets, Steel.
Armco Railroad Sales Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sherardising Plants.
General Electric Co.

Shop Calling Systems—(See Systems, Communication).

Shops, Railroad—(See Buildings, Iron, Steel and Steel Concrete).

Shovels & Draglines.
Industrial Brownhoist Corp.

Shovels, Steam, Gasoline & Electric.
Orton Crane & Shovel Co.

Siding, Iron & Steel.
Armco Railroad Sales Co.

Siding., Bldg., Car, Corrugated & Plain.
Kinnear Mfg. Co.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Inland Steel Co.
Ryerson & Son, Inc., Joseph T.

Siding, Corrugated & Plain.
Carey & Co., Philip, The.
Johns-Manville Corp.

Signal Accessories.
Electric Storage Battery Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Signals, Automatic Cab.
General Railway Signal Co.
Union Switch & Signal Co.

Signal Blades.
General Railway Signal Co.
Union Switch & Signal Co

Signals, Crossing.
Union Switch & Signal Co.

Signals, Crossing Protection.
General Railway Signal Co.
Railroad Supply Co.

Signals, Railway.
General Electric Co.
Union Switch & Signal Co.

Sign Posts, Treated.
Century Wood Preserving Co.
National Lumber & Creosoting Co.

Signs, Highway Crossing.
Railroad Supply Co.

Silico Manganese.
Vanadium Corp. of America.

Slabs, Concrete Floor.
Federal Cement Tile Co.

Slag, Blast Furnace.
Carnegie Steel Co.

Slotting Machines.
Sellers & Co., Inc., Wm.

Slotting Machines, Locomotive Cylinder.
American Steel & Wire Co.

Sludge Removers.
Bird-Archer Co., The.

Soap, Liquid.
West Disinfecting Co.

Solder.
National Bearing Metals Corp.
Ryerson & Son, Inc., Joseph T.
Westinghouse Elec. & Mfg. Co.

Speed Indicators & Recorders.
Valve Pilot Corp.

Spelter—(See Zinc).

Spikes.
American Steel & Wire Co.
Bethlehem Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Splice Bars, Angle.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.

Spring Plates or Seats.
Allegheny Steel Co.
National Malleable & Steel Castings Co.
Union Spring & Mfg. Co.

Springs.
American Steel Foundries Co.
American Steel & Wire Co
Baldwin Locomotive Works The.
Pittsburgh Spring & Steel Co.
Railway Steel Spring Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Switch & Signal Co.

Springs, Shop Equipment.
Ryerson & Son, Joseph T.

Springs, Vanadium Steel.
Pittsburgh Spring & Steel Co.
Union Spring & Mfg. Co.

Stacks, Steel.
American Bridge Co.
Graver Tank & Mfg. Corp.

Stands, Switch & Target.
Q & C Co., The.

Staybolts.
American Locomotive Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Staybolts, Hollow.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Steam Chests.
Franklin Railway Supply Co., Inc.

Steam Enclosures, Corrugated Iron.
Republic Steel Corp.

Steam Shovels.
Orton Crane & Shovel Co.

Steel Alloy.
Illinois Steel Co.
Ryerson & Son, Joseph T.
Republic Steel Corp.
Standard Steel Works Co.

Steel, Firebox.
Carnegie Steel Co.
Illinois Steel Co.

Steel & Iron, Stainless.
Allegheny Steel Co.

Steel, Open Hearth.
Carnegie Steel Co.
Illinois Steel Co.

Steel Plate Construction.
Graver Tank & Mfg. Corp.

Steel, Pressed Specialties.
Hale-Kilburn Co.

Steel, Structural.
American Bridge Co.
Carnegie Steel Co.
Graver Tank & Mfg. Corp.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Steel, Tool.
Illinois Steel Co.
Midvale Co., The.
Q & C Co., The.
Ryerson & Son, Joseph T.

Step Joints.
Q & C Co., The.
Rail Joint Co.

Steps, Car—(See Car Steps, Safety).

Stokers, Locomotive.
Standard Stoker Co.

Stokers, Mechanical.
Westinghouse Elec. & Mfg Co.

Stoker Repair Parts.
Standard Stoker Co.

Storm Sewers, Corrugated Iron.
Republic Steel Corp.

Strainer, Air.
Westinghouse Air Brake Co.

Strainers, Tank Hose.
Prime Mfg. Co., The.

Stringers, Bridge, Treated.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Structural Shapes, Rolled Shapes.
Carnegie Steel Co.

Superheaters.
Superheater Co., The.

Supports, Bottom Rod Safety
Chicago Railway Equipment Co.

Switch Boards.
Graybar Electric Co.
Johns-Manville Corp.
Westinghouse Elec. & Mfg. Co.

Switch Machines.
General Railway Signal Co.

Switch Movements.
Union Switch & Signal Co.

Switch Ties, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Switches, Electric.
Electric Service Supplies Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Switches & Switch Stands.
Ramapo Ajax Corp.

Syphons, Corrugated Iron.
Republic Steel Corp.

Syphons, Locomotive.
Locomotive Firebox Co.

Syphons, Locomotive, Bottom
Locomotive Firebox Co.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tables, Welding.
Oxweld Railroad Service Co., The.

Tamping Machines, Tie.
Ingersoll-Rand Co.

Tamping Outfits, Tie.
Ingersoll-Rand Co.

Tank Cars.
Indian Refining Co.

Tanks, Acetylene, Gas.
Oxweld Railroad Service Co., The.

Tanks, Air, Gas, Oil and Water.
Baldwin Locomotive Works, The.
Graver Tank & Mfg. Corp.

Tanks, Water.
American Bridge Co.
American Locomotive Co.
National Tube Co.
Pressed Steel Car Co.
Westinghouse Air Brake Co.

Tape, Insulation.
Johns-Manville Corp.
Okonite Co., The.
Westinghouse Elec. & Mfg. Co.

Taps, Staybolt.
Ryerson & Son, Joseph T.

Tele. & Tele. Wire.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Supply Corp.

Terminals, Railroad.
United Engineers & Constructors, Inc.

Testers, Boiler.
Sellers & Co., Inc., Wm.

Testers, Gage.
Ashton Valve Co.

Testers, Rail.
Sperry Products, Inc.

Testers, Staybolt.
Flannery Bolt Co.

Testing Machines.
Baldwin-Southwark Corp.

Thermostats.
Gold Car Heating & Lighting Co.
Vapor Car Heating Co., Inc.

Tie Plates.
Bethlehem Steel Co.
Illinois Steel Co.
Railroad Supply Co.

Ties, Creosoted.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Ties, Steel.
American Bridge Co.
Bethlehem Steel Co.
Carnegie Steel Co.

Ties, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.
Southern Wood Preserving Co.

Tile, Cement, Concrete.
Federal American Cement Tile Co.

Timber, Treated.
Central Coal & Coke Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
National Lumber Co.
Southern Wood Preserving Co.

Tires.
Firestone Tire & Rubber Co.
General Tire & Rubber Co.
Goodyear Tire & Rubber Co.
Goodrich Rubber Co., B. F.

Timber, Treated.
American Creosoting Co.
Century Wood Preserving Co.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Tires, Steel.
Edgewater Steel Co.
Midvale Co., The.
Railway Steel Spring Co.
Standard Steel Works Co.

Toilet Papers
U. S. Envelope Co.

Tools, High Speed Steel.
Bethlehem Steel Co.
Bird-Archer Co., The.

Towers, Floodlight.
Pyle-National Co.

Track Skates.
Q & C Co., The.

Tractors.
Caterpillar Tractor Co.
Elwell-Parker Electric Co.
Industrial Lumber Co.
International Creosoting & Construction Co.

Tractors, Industrial.
Elwell-Parker Electric Co.
International Harvester Co.

Tractors, Turntable.
Nichols & Bro., Geo. P.

Train Control Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Tramways, Wire Rope.
American Steel & Wire Co.

Transfer Tables.
American Bridge Co.
Industrial Brownhoist Corp.
Nichols & Bro., Geo. P.

Transformers.
General Electric Supply Corp.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Trap Doors.
Edwards Co., O. M.

Trap Doors & Fixtures.
Tuco Products Corp.

Traps, Steam.
Johns-Manville Corp.

Treads, Bridge Floor.
Carnegie Steel Co.

Treads, Safety.
Ryerson & Son, Joseph T.

Treatment Water—(See Water Softening and Purifying).

Truck Frames—(See Frames, Truck).

Trucks, Oxy-Acetylene Supply.
Oxweld Railroad Service Co., The.

Trucks, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bettendorf Company, The.
Birdsboro Steel Foundry & Machine Co.
Brill Co., The J. G.
Flexible Truck Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Standard Car Truck Co.
Symington Co., The.

Trucks, Cast Steel Tender.
General Steel Castings Corp.

Trucks, Cast Steel, Electric Car.
General Steel Castings Corp.

Trucks, Cast Steel, Car and Locomotive.
General Steel Castings Corp.

Trucks, Electric Storage Battery.
Elwell-Parker Electric Co.

Trucks, Industrial.
Elwell-Parker Electric Co.

Trucks, Motor.
Dodge Motor Truck Corp.
General Motors Truck Co.
International Harvester Co.
Reo Motor Car Co.
White Co., The.

Trucks, Tender.
Flexible Truck Co.

Trucks, Trailer.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.

Tubes, Arch.
National Tube Co.

Tubes, Boiler.
Allegheny Steel Co.
Armco Railroad Sales Co.
Bethlehem Steel Co.
Globe Steel Tubes Co.
National Tube Co.
Ryerson & Son, Joseph T.

Tubes, Boiler, Charcoal Iron.
Bethlehem Steel Co.
Reading Iron Co.

Tubes, Staybolt.
Falls Hollow Staybolt Co.

Tubes, Tire.
Firestone Tire & Rubber Co.
Goodyear Tire & Rubber Co.

Tubing.
Aluminum Co. of America.

Tubing, Seamless Steel.
National Tube Co.

Tungsten Metal.
Vanadium Corp. of America.

Turbo Generators.
Electric Service Supplies Co.
General Electric Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Turnbuckles.
American Bridge Co.
American Steel & Wire Co.
Ryerson & Son, Joseph T.

Turntable Tractors.
Nichols & Bro., Geo. P.

Turntables.
American Bridge Co.
Industrial Brownhoist Corp.
Nichols & Bro., Geo P.

Typewriter Ribbons.
Remington-Rand Business Service.

Typewriters.
Remington-Rand Business Service.

Uncoupling Device.
Hutchins Car Rfg. Co.

Undercrossings, Corrugated Iron.
Republic Steel Corp.

Underfloor Duct.
General Electric Supply Corp.

Underfloor Duct, Fibre and Metal.
Johns-Manville Corp.

Underframes, Cast Steel, Tender.
General Steel Castings Corp.

Underframes, Cast Steel, Freight Car.
General Steel Castings Corp.

Underframes, Steel.
Bettendorf Co., The.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Underground Conduit.
General Electric Supply Corp.

Upholstery, Car.
Brill Co., The J. G.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Valve Caps.
Schrader's Son, Inc., A.

Valve Gears, Locomotive.
Pyle-National Co.

Valves, Air Brake.
Westinghouse Air Brake Co.

Valves, Back Pressure Acetylene.
Oxweld Railroad Service Co., The.

Valves, Balanced Slide
Hammet, H. G.

Valves, Blow-Off.
Bird-Archer Co., The.

Valves, Check & Angle Steam
Sellers & Co., Inc., Wm.

Valves, Drifting.
Ardco Mfg. Co.
Sellers & Co., Inc., Wm.

Valves, Hydraulic.
Birdsboro Steel Foundry & Machine Co.

Valves, Piston.
Franklin Railway Supply Co., Inc.

Valves, Pop, Safety & Relief.
Ashton Valve Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Valves, Pressure Regulating.
Gold Car Heating & Lighting Co.

Valves, Throttle.
American Throttle Co., Inc.
Bradford Corporation.

Valves, Fire.
Schrader's Son, Inc., A.

Varnish Powder.
Aluminum Co. of America.

Varnishes.
General Electric Supply Corp.
Lowe Bros. Co., The
Sherwin-Williams Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Ventilators, Car.
Gold Car Heating & Lighting Co.

Ventilators, Shop & Roundhouse.
Carey Co., Philip, The.
Johns-Manville Corp.

Wardrobes, Rolling and Disappearing Front — (See Lockers).

Washers.
National Malleable & Steel Castings Co.
Ryerson & Son, Joseph T.
Wine Railway Appliance Co.

Washers, Boiler.
Sellers & Co., Inc., Wm.

Waterproofing Materials and Compounds.
Carey Co., Philip, The.
Johns-Manville Corp.
Lehon Co., The.

Water Purifying Materials & Compounds.
Bird-Archer Co., The.
Dearborn Chemical Co.

Water Softening & Purifying.
Bird-Archer Co., The.
Dearborn Chemical Co.
Graver Tank & Mfg. Corp.
Permutit Co., The.

Weather Stripping.
Tuco Products Corp.

Wedges, Automatic.
Franklin Railway Supply Co., Inc.

Wedges, Journal Box.
American Steel Foundries.
Gould Coupler Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Symington Co., The.

Weed Killer.
Q & C Co., The.

Welding Machines, Acetylene.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Welding Machines, Electric.
General Electric Co.
Ryerson & Son, Joseph T.

Welding Machines, Flue.
Ryerson & Son, Joseph T.

Welding Materials.
Oxweld Railroad Service Co.
Franklin Railway Supply Co., Inc.

Welding Process.
Oxweld Railroad Service Co.

Welding Rods.
American Steel & Wire Co.
General Electric Supply Corp.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.

Welding Supplies.
General Electric Co.
Oxweld Railroad Service Co., The.

Welding and Cutting Apparatus—(See Cutting and Welding Apparatus).

Well Casings, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Wheel Centers, Driving.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works, The.
Birdsboro Steel Foundry & Machine Co.
Edgewater Steel Co.
Hunt-Spiller Mfg. Corp.
Standard Steel Works Co.
Union Steel Casting Co.

Wheels, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works, The.
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Mt. Vernon Car Mfg. Co
Pressed Steel Car Co.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Cast Iron, Chilled Tread.
Assn. of Mfrs. of Chilled Car Wheels.
Graybar Electric Co.
Griffin Wheel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Wheels, Mine Car.
Carnegie Steel Co.
Edgewater Steel Co.
Mt. Vernon Car Mfg. Co.
Standard Steel Works Co.

Wheels, Passenger Car.
Carnegie Steel Co.
Illinois Steel Co.
Edgewater Steel Co.
Pullman Car & Mfg. Corp.
Standard Steel Works Co.

Wheels, Steel and Steel Tired.
American Locomotive Co.
American Steel Foundries.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Lima Locomotive Works.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Wrought Steel.
Armco Railroad Sales Co.
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
Standard Steel Works Co.

Whistles.
Ashton Valve Co.

Whistles, Locomotive.
General Electric Co.
Westinghouse Air Brake Co.

Window Fixtures.
Edwards Co., O. M.
Tuco Products Corp.

Wire.
American Steel & Wire Co.
Kerite Insulated Wire & Cable Co.
Okonite Co., The.

Wire, Fence.
American Steel & Wire Co.

Wire, Insulated.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Electric Co.
Graybar Electric Co.
Kerite Insulated Wire & Cable Co.
Okonite Co., The.

Wire, Rail Bond.
American Steel & Wire Co.
Graybar Electric Co.

Wire Rope Clips.
American Steel & Wire Co.

Wire Rope.
American Steel & Wire Co.

Wire, Telephone & Telegraph.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
Graybar Electric Co.

Wire, Welding.
American Steel & Wire Co.
Oxweld Railroad Service Co., The.

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Pyle-National Co.

Wood, Treated.
Century Wood Preserving Co.
Curtin Howe Corp.
National Lumber & Creosoting Co.

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Wood, Preservative Treatment (Zinc Meter Arsenic).
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National Lumber & Creosoting Co.

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OF ALL the gas-electric rail cars now operating in North America, more than two-thirds are equipped with the General Electric rail-car transmission. This wide acceptance is a result of coördinated design—the generator, motors, control, and air compressor are integral parts of a transmission unit which conforms to the characteristics of the engine and meets all service and operating conditions. The following roads use G-E equipped rail cars:

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Burlington-Rock Island
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Canadian Pacific
Central Vermont
Chesapeake & Ohio
Chicago & Alton
Chicago, Burlington & Quincy
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Chicago Great Western
Chicago, Milwaukee, St. Paul & Pacific
Chicago & Northwestern
Chicago, Rock Island & Pacific
Cincinnati Northern (Big Four)
Colorado & Southern
Erie
Grand Trunk
Great Northern
Gulf, Mobile & Northern
Huntingdon & Broad Top Mountain
Lehigh Valley
Lehigh & New England
Louisville & Nashville
Maryland & Pennsylvania
Minneapolis & St. Louis
Minneapolis, St. Paul & Sault Ste. Marie
Missouri-Kansas-Texas
Missouri Pacific
Mobile & Ohio
National Railways of Mexico
New York Central
New York, New Haven & Hartford
Northern Pacific
Pennsylvania
Reading Co.
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Note these 6 features of the UNION "TYPE T" CROSSHEAD

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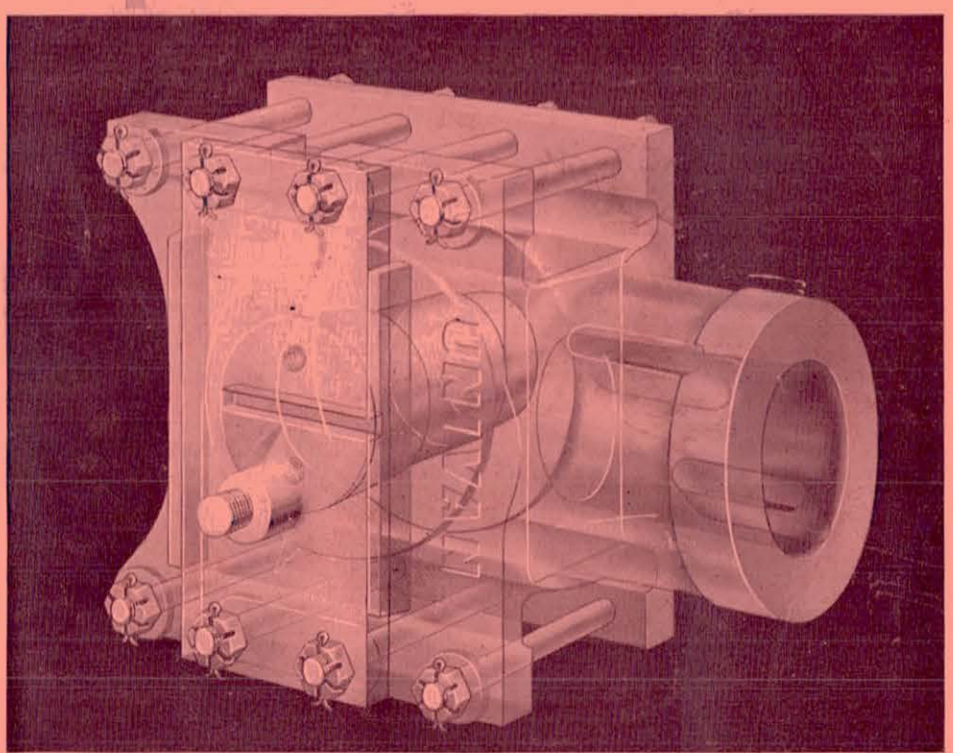

30 YEARS EXPERIENCE

1 To remove and replace the ordinary wrist pin, which must be applied from the inside, the locomotive must be "spotted" to allow the pin to be handled through between the spokes of the wheel. This procedure is costly both in labor time and in locomotive time, and is a dangerous operation as there are several elements of risk, known only too well to the mechanic making the change. The "Type T" Crosshead has its wrist pin applied from the outside, thus eliminating all dangerous operations and in a much shorter time with resulting savings in running repairs and locomotive hours.

2 The ordinary wrist pin may lose the nuts, or the outer end may break off allowing the pin to work in and cause extensive damage, sometimes even stripping the engine. This cannot occur with the "Type T" pin.

3 The small dowel or key which is intended to keep the pin from turning in the fits is often sheared off the ordinary wrist pin. When this happens the pin turns in the taper fits, tears out or galls them, and ruins the crosshead. The "Type T" wrist pin is secured from turning by the tongue on a keeper plate. This plate is held securely by two lugs cast on the face of the crosshead body, and by top and bottom bolts.

4 "Type T" wrist pin is very simple and inexpensive to machine. There are no threads to cut, and no heating or forging is required. This design does not add materially to the weight or to the clearance required.

5 "Type T" Crossheads are made of "UNIVAN" —That Tough Steel—a special cast alloy steel which will withstand extreme shocks and stresses.

6 Your present pattern can be used with slight changes which we will make without charge. Send us your prints and let us prepare a sketch and submit a proposal. This service will not obligate you in any way.

Manufactured Exclusively By

UNION STEEL CASTING CO.

PITTSBURGH, PA.